4.0 DATA COLLECTION ACTIVITIES

4.1 Introduction

As part of the Landfills industry study, EPA collected data from a variety of different sources. These sources included existing data from previous EPA and other governmental data collection efforts, industry provided information, new data collected from questionnaire surveys, and field sampling data. Each of these data sources is discussed below, as well as the quality assurance/quality control (QA/QC) and other data editing procedures. Summaries and analyses of the data collected by EPA are presented in Chapters 5 through 10.

4.2 Preliminary Data Summary

EPA's initial effort to develop effluent limitations guidelines and pretreatment standards for the waste treatment industry began in 1986. EPA conducted a study of the hazardous waste treatment industry in which it determined the scope of the industry, its operations, and types of discharges. In this study, the hazardous waste treatment industry included landfills with leachate collection and treatment facilities, incinerators with wet scrubbers, and aqueous hazardous waste treatment facilities. This study characterized the wastewaters generated by facilities in the industry and the wastewater treatment technologies used to treat these wastewaters. In addition, the study included industry profiles, the cost of wastewater control and treatment, and environmental assessments. The results of this study were published by EPA in a report entitled "Preliminary Data Summary for the Hazardous Waste Treatment Industry" (EPA 440/1-89-100), in September, 1989.

The data presented in this report were collected from the following sources:

- EPA Office of Research and Development databases: includes field sampling efforts at 13 hazardous waste landfills in 1985.
- State Agencies: includes a Wisconsin sampling program of 20 municipal landfills in 1983.

- EPA Office of Emergency and Remedial Response Contract Laboratory Program (CLP) Statistical Database, "Most Commonly Occurring Analytes in 56 Leachate Samples." 1980-83 data.

- National Enforcement Investigations Center (NEIC) sampling program conducted for the Hazardous Waste Groundwater Task Force during 1985.

- EPA sampling at 6 landfill facilities (1986-1987).

- Subtitle D leachate data for miscellaneous Subtitle D landfills, compiled by the EPA Office of Solid Waste.

The EPA Preliminary Data Summary identified 911 landfills that generate leachate. Of these, 173 discharged their leachate directly to surface waters, and 355 discharged indirectly through publicly owned treatment works (POTWs). The remaining 383 used other methods of leachate disposal. The most common "other" disposal method was contract hauling to a commercial aqueous waste treatment facility. However, some facilities land applied their leachate (spraying of the leachate over the landfill) or injected it into a deep well for disposal.

The key findings of the EPA Preliminary Data Summary included:

- Some leachates were found to contain high concentrations (e.g., over 100,000 micrograms per liter (µg/l)) of toxic organic compounds.

- Raw leachates were found to contain high concentrations of BOD_5, COD, and TOC.

- Leachate flow rates varied widely due to climatic and geological conditions and landfill size. An average landfill was estimated to have a leachate generation rate of approximately 30,000 gallons per day (gpd).

- Due to current RCRA regulations, the number of leachate collection systems used at landfills was expected to increase.

- RCRA regulations also would cause solid waste generators to increase their use of commercial landfill facilities.

A wide range of biological and physical/chemical treatment technologies were found to be in use by landfills, capable of removing high percentages of conventional, nonconventional, and toxic pollutants. Advanced treatment technologies identified in this study include air stripping, ammonia stripping, activated carbon, and lime precipitation.

After a thorough analysis of the landfill data presented in the Preliminary Data Summary, EPA identified the need to develop an effluent guidelines regulation for the Landfills industry in order to set national guidelines and standards. EPA's decision to develop effluent limitations guidelines was based on the Preliminary Data Summary's assessment of the current and future trends in the Landfills industry, its analysis of the concentrations of pollutants in the raw leachate, and the study's discussion on the treatment and control technologies available for effective pollution reduction in landfill leachate.

4.3 Clean Water Act Section 308 Questionnaires

A major source of information and data used in developing effluent limitations guidelines and standards was industry responses to detailed technical and economic questionnaires, and the subsequent detailed monitoring questionnaires, distributed by EPA under the authority of Section 308 of the Clean Water Act. These questionnaires requested information on each facility's industrial operations, ownership status, solid wastes disposed, treatment processes employed, and wastewater discharge characteristics. EPA first developed a database of various types of landfills in the United States using information collected from: 1) State environmental and solid waste departments, 2) other State agencies and contacts, 3) the National Survey of Hazardous Waste Treatment Storage, Disposal and Recycling Facilities respondent list, 4) Environmental Ltd.'s 1991 Directory of Industrial and Hazardous Waste Management Firms, 5) the Resource Conservation and Recovery Act (RCRA) 1992 list of Municipal Landfills, and 6) the Resource Conservation and Recovery Information System (RCRIS) National Oversight Database. Based upon these sources, the initial population of 10,477 facilities in the landfill database was divided into two categories: 595 Subtitle C hazardous and 9,882 Subtitle D non-hazardous facilities.

This database served as the initial population for EPA to collect industry provided data. EPA's data collection process involved three stages:

- Screener Surveys
- Detailed Technical Questionnaires
- Detailed Monitoring Questionnaires

Each of these data collection activities are discussed in the following sections. A more detailed discussion of the landfills survey population can be found in Appendix A.

4.3.1 Screener Surveys

Once the database identifying the number of landfills in the U.S. was complete, EPA developed a screener survey to collect initial data on all possible landfill sites in the U.S. and to update information on ownership and facility contacts.

4.3.1.1 Recipient Selection and Mailing

The 10,478 facilities were divided into four strata for the purpose of determining the screener survey recipients. These strata were defined as:

1. Subtitle C facilities.
2. Subtitle D facilities that are known wastewater generators.
3. Subtitle D facilities in states with no more than 100 landfills and are not known to be wastewater generators.
4. Subtitle D facilities in states with more than 100 landfills and are not known to be wastewater generators.

All of the facilities in strata 1, 2, and 3 were selected to receive the screener survey. A random sample of the facilities in stratum 4 were selected. Table 4-1 presents the sample frame, number of facilities sampled, and the number of respondents to receive the screener survey.

Table 4-1: Screener Questionnaire Strata

Screener Stratum (g)	Number in Frame (N_g)	Number Sampled (n_g)	Number of Responses (n'_g)
1	595	595	524
2	134	134	120
3	892	892	722
4	8,856	3,375	2,621
Total	10,477	4,996	3,987

4.3.1.2 Information Collected

Information collected by the screener surveys included:

- mailing address.
- landfill type, including types and amount of solid waste disposed and landfill capacity.
- wastewater generation rates as a result of landfill operations, including leachate, gas condensate, and contaminated groundwater.
- regulatory classification and ownership status.
- wastewater discharge status.
- wastewater monitoring practices.
- wastewater treatment technology in use.

4.3.1.3 Data Entry, Coding, and Analysis

The EPA operated a toll-free help line to assist the screener recipients with filling out the 3-page survey. The Agency responded to several thousand phone calls from facilities over a six week period. The help line answered questions regarding applicability, EPA policy, and economic and technical details.

All screener surveys returned to EPA were reviewed manually to verify that each respondent completed the critical questions in the survey (e.g., wastewater generation and collection, number and types of landfills, discharge status, and wastewater treatment technology). The screeners were in a bubble-sheet format and were scanned directly into a computer database. Once entered, the database was checked for logical inconsistencies and follow up contacts were made to facilities to resolve any inconsistencies.

After the QA process, facilities in the database were divided into two groups: 1) facilities that indicated they collected landfill generated wastewaters; and 2) those that did not. Facilities that did not collect landfill generated wastewaters were considered out of the scope of the Landfills industry study and were not investigated further.

4.3.1.4 Mailout Results

Of the 4,996 screener questionnaires mailed by EPA, 3,628 responded, and of those, 3,581 were eligible and complete and were entered into the screemer database. Of these, EPA identified 859 facilities that generate and collect one or more types of landfill generated wastewaters.

4.3.2 Detailed Technical Questionnaires

Once the information from the screener surveys was entered into the database and analyzed, EPA then developed a detailed technical and economic questionnaire to obtain more information from facilities that collect landfill generated wastewater as indicated in their screener survey.

4.3.2.1 Recipient Selection and Mailing

The 859 facilities that were found to generate and collect landfill wastewater from the screener database, plus one pre-test questionnaire facility that was not in the screener database, were used as the frame for selection of facilities to be sent a Detailed Questionnaire. These facilities were divided into the following eight strata:

1. Commercial private, municipal, or government facilities that have wastewater treatment and are direct or indirect dischargers.
2. Commercial private, municipal, or government facilities that have wastewater treatment and are not direct or indirect dischargers.
3. Non-commercial private facilities with wastewater treatment
4. Facilities with no wastewater treatment
5. Commercial facilities that accept PCB wastes
6. Municipal hazardous waste facilities
7. Small businesses with no wastewater treatment
8. Pre-test facilities that were not in the screener population

All facilities in strata 1, 5, 6, 7, and 8 were selected to receive the Detailed Questionnaire. A random sample of the facilities in strata 2, 3, and 4 were selected to receive the Detailed Questionnaire.

This selection criteria resulted in a mailing of the Detailed Questionnaire to 252 facilities. The population analysis (referred to as national estimates) conducted on these questionnaire recipients is discussed briefly in Chapter 3 (Section 3.2.1) and in greater detail in the rulemaking record for this proposed regulation under the topic "Statistical Analysis of Questionnaire Data".

4.3.2.2 Information Collected

The Detailed Questionnaire solicited technical and costing information regarding landfill operations at the selected facilities and was divided into the following four sections:

- Section A - Facility Identification and Operational Information:

  1. General facility information, including: ownership status, landfill type, the number of landfills on site, regulatory status, discharge status, when the landfill began accepting waste, and projected closure date.

  2. Landfill operation, including: types of waste accepted at the landfill, the amount of waste accepted, landfill capacity, how the waste was organized in the landfill, landfill caps, and landfill liners.

  3. Wastewater generation from landfill operations, including: the types of wastewater generated and the generation rates, and the ultimate disposal of the wastewaters generated and collected.

- Section B - Wastewater Treatment:

  1. Description of treatment methods employed by the facility to treat the wastewaters identified in Section A. This description includes a discussion of commingled wastewaters, wastewater treatment technologies, residual waste disposal, and treatment plant capacities.

- Section C - Wastewater Monitoring Data:

  1. A summary of the monitoring data pertaining to the landfill generated wastewaters identified in Section A that were collected in 1992 by the facility, including: minimum, maximum, averages, number of observations, and sampling and analytical methods.

- Section D - Detailed Wastewater Treatment Design Information:

  1. Detailed technical design, operation and costing information pertaining to the wastewater treatment technologies identified in Section B.

4.3.2.3 Data Entry, Coding, and Analysis

The EPA operated a toll-free help line to assist the questionnaire recipients with filling out the Detailed Questionnaire. The EPA responded to over one thousand phone calls from facilities over a three month period. While some calls pertained to questions of applicability, most were of a technical nature regarding specific questions in the questionnaire.

Once the completed questionnaires were received by the EPA, each one was thoroughly reviewed for technical accuracy and content. After the questionnaire was reviewed, it was coded for double-key entry into the questionnaire database. All discrepancies between the two inputted values were corrected by referring to the original questionnaire.

Several QA/QC procedures were implemented for the questionnaire database, including a manual completeness and accuracy check of a random selection of 20 percent of the questionnaires and a database logic check of each completed questionnaire. These QA/QC procedures helped verify the questionnaires for completeness, resolve any internal consistencies, and identify outliers in the data which were checked for accuracy.

4.3.2.4 Mailout Results

Of the 252 recipients, 220 responded with sufficient technical and economic data to be included in the final EPA Detailed Questionnaire database.

4.4 Detailed Monitoring Questionnaire

In addition to the Detailed Questionnaire, EPA also requested detailed wastewater monitoring information from 27 facilities included in the Detailed Questionnaire database via a Detailed Monitoring Questionnaire.

4.4.1 Recipient Selection and Mailing

These facilities were selected based upon their responses to the Detailed Questionnaire. EPA reviewed each facility's monitoring summary, discharge permit requirements, and their on-site treatment technologies. From these responses, EPA selected 27 facilities to receive a Detailed Monitoring Questionnaire which could provide useful information on technology performance, pollutant removals, and wastewater characterization.

4.4.2 Information Collected

Facilities selected to receive the Detailed Monitoring Questionnaire were requested to send analytical data (1992, 1993, and 1994 annual data) on daily equalized influent to their wastewater treatment system, as well as effluent data from the treatment system. The three years of analytical data assisted EPA in calculating the variability factors (Chapter 11) used in determining the industry effluent limits. Analytical data for intermediate waste treatment points also were requested for some facilities. In this manner, EPA was able to obtain performance information across individual treatment units in addition to the entire treatment train.

4.4.3 Data Entry, Coding, and Analysis

EPA conducted a thorough review of each Detailed Monitoring Questionnaire response to ensure that the data provided was representative of the facility's treatment system. EPA collected data from 24 semi-continuous and continuous treatment systems and 2 batch treatment systems. A Detailed Monitoring Questionnaire database then was developed which included all monitoring data submitted by the selected facilities.

4.5 Engineering Site Visits

EPA conducted engineering site visits at 19 facilities including one facility outside the U.S. The purpose of these visits was to evaluate each facility as a potential week-long sampling candidate to collect treatment performance data. The selection of these facilities was based on the responses to the Detailed Questionnaire and included facilities from as broad a cross section of the industry as possible. EPA visited landfills of various ownership status (municipal, commercial, captive), landfills that accept various waste types (construction and demolition, ash, sludge, industrial, municipal, hazardous), and landfills in different geographic regions of the country. Facilities selected for engineering site visits employed various types of treatment processes, including: equalization, chemical and biological treatment, filtration, air stripping, steam stripping, and membrane separation.

Each landfill was visited for one day. During the engineering site visit, EPA obtained information on:

- the facility and its operations.
- the wastes accepted for treatment and the facility's acceptance criteria.
- the raw wastewater generated and its sources.
- the wastewater treatment on site.
- the location of potential sampling points.
- the site-specific sampling needs, issues of access, and required sampling safety equipment.

Table 4-2 presents a summary of the landfill facilities that were included in the engineering site visits.

4.6 Wastewater Characterization Site Visits

While conducting engineering site visits to landfill facilities, EPA also collected samples for raw wastewater characterization at 15 landfills. EPA collected grab samples of untreated wastewater at various types of landfills and analyzed for constituents in the wastewater including conventionals, metals, organics, pesticides and herbicides, PCBs, and dioxins and furans. Chapter 6 presents the characterization data obtained by EPA.

Table 4-2 also presents a summary of the landfill facilities by type that were included in the characterization site visits and the number of wastewater characterization samples collected.

4.7 EPA Week-Long Sampling Program

To collect wastewater treatment performance data, EPA conducted week-long sampling efforts at six landfills. Selection of these facilities was based on the analysis of the information collected during the engineering site visits. Table 4-3 presents a summary of the types of landfills sampled and treatment technologies evaluated.

EPA prepared a detailed sampling plan for each sampling episode. Wastewater samples were collected at influent, intermediate, and effluent sample points throughout the entire on-site wastewater treatment system. Sampling at five of the facilities consisted of 24-hour composite samples for five consecutive days. For the sixth facility, composites were taken of four completed batches over five days. Individual grab samples were collected for oil and grease. Volatile organic grab samples were composited in the laboratory prior to analysis.

Samples then were analyzed using EPA Office of Water approved analytical methods. The following table presents the pollutant group and the analytical method used:

Pollutant Group	Analytical Method
Conventional and Nonconventionals	Standard Methods
Metals	EPA 1620
Organics	EPA 1624, 1625
Herbicides, Pesticides, PCBs	EPA 1656, 1657,1658
Dioxins/Furans	EPA 1613

Data resulting from the influent samples were used to characterize raw wastewater for the industry and develop the list of pollutants of interest. The data collected from the influent, intermediate, and effluent points were used to evaluate performance of the wastewater treatment systems, develop current discharge concentrations, pollutant loadings, and the best available treatment (BAT) options for the Landfills industry. Data collected from the effluent points were used to calculate long term averages for each of the proposed regulatory options.

4.8 Other Data Sources

In addition to the original data collected by EPA, other data sources were used to supplement the industry database. Each of these data sources is discussed below.

4.8.1 Industry Supplied Data

The Landfills industry was requested to provide relevant information and data. Leachate and groundwater characterization and treatability studies were received from several facilities, including 25 discharge monitoring report (DMR) data packages. Industry supplied data was used to characterize the industry, develop pollutant loadings, and develop effluent limitations.

4.8.2 Comprehensive Environmental Response, Compensation and Liability Act (CERCLA)/Superfund Amendments and Reauthorization Act (SARA) Groundwater Data

Groundwater data was obtained from the "CERCLA Site Discharges To POTWs Treatability Manual" (EPA 540/2-90-007), prepared by the Industrial Technology Division of the EPA Office of Water Standards and Regulations for the EPA Office of Emergency and Remedial Response. Data from this study were used to supplement the groundwater data collected during characterization and week-long sampling events. The purpose of the study was to:

- Identify the variety of compounds and concentration ranges present in groundwater at CERCLA sites.
- Collect data on the treatability of compounds achieved by various on-site pretreatment systems.
- Evaluate the impact of CERCLA discharges to a receiving POTW.

A total of eighteen CERCLA facilities were sampled in this study; however, only facilities that received contaminated groundwater as a result of landfilling activities were selected to be used in conjunction with the EPA groundwater sampling data. The data from seven CERCLA facilities were combined with EPA sampling data to help characterize the hazardous subcategory and to develop both the current discharge concentrations and pollutant loadings for facilities in the hazardous subcategory.

4.8.3 POTW Study

EPA used the data included in the report entitled "Fate of Priority Pollutants in Publicly Owned Treatment Works" (EPA 440/1-82-303), commonly referred to as the "50-POTW Study", in determining those pollutants that would pass through a POTW. This study presents data on the performance of 50 representative POTWs that generally achieve secondary treatment (30 mg/l of BOD_5 and TSS). Additional work performed with this database included the revision of some data editing criteria. Because the data collected for evaluating POTW removals included influent levels of pollutants that were close to the detection limit, the POTW data were edited to eliminate low influent concentration levels. The data editing rules for the 50-POTW study were as follows: 1) detected pollutants must have at least 3 pairs (influent/effluent) of data points to be included, 2) for analytes that included a combination of high and low influent concentrations, the data were edited to eliminate all influent values, and corresponding effluent values, less than 10 times the minimum level, 3) for analytes where no influent concentrations were greater than 10 times the minimum level, all influent values less than five times the minimum level and the corresponding effluent values were eliminated, and 4) for analytes where no influent concentration was greater than five times the minimum level, the data were edited to eliminate all influent concentrations, and corresponding effluent values, less than 20 µg/l. The remaining averaged pollutant influent values and the corresponding averaged effluent values then were used to calculate the average percent removal for each pollutant when conducting the POTW pass-through analysis for this industry, which is discussed in detail in Chapter 7.

4.8.4 National Risk Management Research Laboratory Data

EPA's National Risk Management Research Laboratory (NRMRL) developed a treatability database (formerly called the Risk Reduction Engineering laboratory (RREL) database). This computerized database provides information, by pollutant, on removals obtained by various treatment technologies. The database provides the user with the specific data source and the industry from which the wastewater was generated. The NRMRL database was used when conducting the POTW pass-through analysis by supplementing the treatment information provided in the 50-POTW study when there was insufficient information on specific pollutants. For each of the pollutants of interest not found in the 50-POTW database, data from portions of the NRMRL database were obtained. These files were edited so that only treatment technologies representative of typical POTW secondary treatment operations (e.g., activated sludge, activated sludge with filtration, aerobic lagoons) were used. The files were further edited to include information pertaining to domestic or industrial wastewater, unless only other wastewater data were available. Pilot-scale and full-scale data were used; bench-scale data were eliminated. Data only from a paper in a peer-reviewed journal or government report were used; lesser quality references were edited out. Additionally, acceptable references were reviewed and non-applicable study data were eliminated. From the remaining pollutant removal data, the average percent removal for each pollutant was calculated. The pass-through analysis conducted for this industry is discussed in detail in Chapter 7.

4.9 QA/QC and Other Data Editing Procedures

This section presents the quality assurance/quality control (QA/QC) procedures and editing rules used to analyze the different analytical data sets that were described in the previous sections; including industry supplied data, Detailed Questionnaire data, Detailed Monitoring Questionnaire data, EPA field sampling, and analytical data collected by other EPA organizations. Slightly different conventions were used in setting limits (see the “Statistical Support Document for Proposed Effluent Limitations Guidelines and Standards for the Landfills Category”, EPA 821-B-97-006).

4.9.1 QA/QC Procedures

Each analytical data source received a QA/QC review before being included in the EPA analytical, Detailed Questionnaire, and Detailed Monitoring Questionnaire databases. The specific QA/QC activities completed for each analytical data source are discussed below.

4.9.2 Analytical Database Review

The EPA sampling program analytical data were managed by EAD's Sample Control Center. The Sample Control Center developed and maintained the analytical database, as well as provided a number of QA/QC functions, the findings of which were documented in data review narratives. Completeness checks then were performed to ensure the completeness of the analytical database. Both of these QA/QC activities are discussed below. In addition, the following paragraphs outline the editing procedures and data conventions used to finalize the landfill analytical database, to characterize each industry subcategory, and to develop current discharge information and pollutant loadings.

4.9.2.1 Data Review Narratives

The Sample Control Center performed a QA/QC data review and documented their findings in the data review narrative that accompanied each laboratory data package. The data review narrative identified missing data and any other data discrepancies encountered during the QA/QC review. The narratives then were checked against the data and sampling episode traffic reports to make sure no data discrepancies were overlooked.

4.9.2.2 Completeness Checks

A data completeness check of the analytical database was performed by cross referencing the list of pollutants requested for analysis with the list of pollutants the laboratory actually analyzed at each sample point. This was accomplished by preparing:

- a list of all requested analytical methods and method numbers.

- a list of all pollutants and CAS numbers specified under each requested analytical method.

- a schedule of analyses requested by episode for each sample point.

The purpose of the completeness check was to verify that all analyses requested were performed by the laboratory and posted to the database in a consistent manner. The completeness check resulted in identifying:

- any pollutant that was scheduled to be analyzed but was not analyzed.

- pollutants that were analyzed but were not scheduled to be analyzed.

- any pollutant for which the expected number of samples analyzed did not agree with the actual number of samples analyzed.

Discrepancies then were then evaluated and resolved by subsequent QA/QC reviews. All changes to data in the landfill analytical database were documented in a status report prepared by the Sample Control Center entitled "Status of the Waste Treatment Industry: Landfills Database".

4.9.2.3 Trip Blanks and Equipment Blanks

Qualifiers assigned to data as a result of trip blank and equipment blank contamination were addressed in the same way the Sample Control Center addressed contamination of lab method blanks:

- Sample Results Less than Five Times Blank Results: When the sample result was less than five times the blank result, there were no means by which to ascertain whether the presence of the analyte could have attributed to blank contamination. Therefore, the result was included in the database as non-detect, with a nominal detection limit equal to the dilution-adjusted instrument detection limit.

- Sample Results Greater than Five Times but Less than Ten Times Blank Results: These data were of acceptable quality and were used to represent maximum values.

- <u>Sample Results Greater than Ten Times Blank Results or Analyte not Detected in Sample</u>: The presence of the analyte in the blank did not adversely affect the data in those cases where the sample results were greater than ten times the associated blank results or when the analyte was not detected in associated samples. Such data were acceptable without qualification.

4.9.2.4 Field Duplicates

Field duplicates were collected during the EPA sampling episodes to help determine the accuracy and consistency of the sampling techniques employed in the field. In the analytical database, field duplicate results were represented by the letter "D" preceding the sample point number. Duplicate samples considered acceptable were combined on a daily basis using the following rules:

- If all duplicates were non-detect values, then the aggregate sample was labeled non-detect (ND), and the value of the aggregate sample was the maximum of the ND values.

- If the maximum detected value was greater than the maximum ND value, then the aggregate sample was labeled NC, and the value of the aggregate sample was the sum of the non-censored (NC) and ND values divided by the total number of duplicates for that independent sample.

- If the maximum NC value was less than or equal to the maximum ND value, then the aggregate sample was labeled ND and the value of the aggregate sample was the maximum of the ND values.

- If all duplicates were NC values, then the aggregate sample was labeled NC and the value of the aggregate sample was the average of the NC values.

In the laboratory, analytical precision was calculated by determining the relative percent difference of paired spiked samples. Data was considered acceptable if the relative percent difference was within the laboratory criteria for analytical precision.

Duplicate relative percent difference values were considered acceptable if they were within the laboratory criteria for analytical precision plus or minus 10 percent.

4.9.2.5 Grab Samples

Most data presented in the analytical database represent composite sample results, but other types of results exist due to sampling requirements. Most grab sample results were represented by the letters “A”, “B”, or “C” following the sample point number in the analytical database for grabs collected on the same day. Grab samples of this nature were only collected for oil and grease/hexane extractable material and were included when calculating average concentrations of pollutants. Grab samples of any kind were averaged on a daily basis before being used in data analyses.

4.9.2.6 Non-Detect Data

Non-detect data were given numeric values so that they could be considered in the data analyses. Non-detect data can be set either at the method detection limit, at the instrument detection limit, at half of the method detection limit, or equal to zero. Detection limits can be standardized (as in the method detection limit) or variable (as in the instrument detection limit or the sample detection limit, which may vary depending on dilution). The instrument detection limit is the lowest possible detection limit; the instrument cannot detect the contaminant below this level. In many cases, the method detection limit is significantly higher than the instrument detection limit.

For the Landfills industry, all non-detect data collected from the EPA sampling episodes used in calculations were defined as follows: 1) the value used for non-detect data was represented by the detection limit reported in the analytical database, and 2) if the detection limit of the non-detect data was greater than the detected results, the average was calculated using all of the data, but the results were flagged for review on an individual basis. When flagged results were reviewed as a whole, the high detection limits were found to be on the same order of magnitude as the detect values; therefore, all flagged data were included in calculating averages.

4.9.2.7 Bi-Phasic Samples

In one sampling episode for a captive hazardous landfill at an industrial facility, some samples collected became bi-phasic. For these samples, analytical results for each phase were reported separately. Consolidated results for the bi-phasic samples were calculated by factoring the percent of each phase relative to the total sample volume with the results of each phase and adding the weighted results together. Pollutants were not always detected in both the aqueous and organic phases of a bi-phasic sample. In instances where a pollutant was detected in one phase and not in the other phase, the detection limit was set at zero, which removed the non-detect phase from the equation. When both phases were non-detect, the lowest of the two detection limits was used as the result.

4.9.2.8 Conversion of Weight/Weight Data

In some cases, wastewater samples collected in the field were analyzed as solids due to criteria specified in the analytical method. These results were reported in the database in solids units of µg/kg or ng/kg, and needed to be converted to µg/l and ng/l, respectively, to be used in data analysis. Conversion factors were supplied in the database to convert these solid units (weight/weight) to volumetric units (weight/volume).

The landfill analytical database contained a file called “solids” that contained percent solids values for those samples associated with a result that were reported on a weight/weight basis. This percent solids value was necessary to convert results from a weight/weight basis to a weight/volume basis.

The following formula was utilized to convert the “amount” from a weight/weight basis to a weight/volume basis. This formula assumed a density of 1:

$$\text{Amount (weight/weight)} \times (\text{percent Solids}/100) = \text{Amount (weight/volume)}$$

where,

Amount =	The result contained in the “amount” field in the “result” file.
percent Solids =	The percent solids result contained in the “percent” field in the “solids” file.

After conversion, the amount was expressed in weight/volume units as shown below:

Weight/Weight Units	Weight/Volume Units
pg/kg	pg/l
ng/kg	ng/l
µg/kg	µg/l
µg/g	µg/ml
mg/kg	mg/l

4.9.2.9 Average Concentration Data

All data conventions discussed above were employed when the average concentration of a group of data was calculated. Average concentrations were calculated to develop raw waste loads, current discharge concentrations, and percent removal values. To calculate the average concentration of a pollutant at a particular sample point, the following hierarchy was used: 1) all non-detect data was set at the detection limit listed in the database, 2) all weight/weight units were converted to weight/volume units using the percent solids file, 3) all units were then converted to µg/l, 4) the bi-phasic sample results were combined into one consolidated result, 5) both duplicate pairs and grab samples were combined using the rules discussed above, and 6) the weekly average was calculated by adding all results and dividing by the number of results.

4.9.3 Detailed Questionnaire Database Review

Each Detailed Questionnaire was reviewed for: 1) completeness, 2) internal consistency, and 3) outliers. Outliers refer to data values that are well outside those expected for this industry. For example, flow rates above 10 million gallons per day would be considered suspect. In cases such as this, the QA/QC reviewer would verify the accuracy and correctness of the data.

All information that was computerized was given a 100 percent QA/QC check to ensure that all data were inputted properly. This was accomplished by double key entry, and any discrepancies between the two inputted values compared with the original submission were corrected.

Additional handling procedures for Detailed Questionnaires were presented earlier in Section 4.3.2.

4.9.4 Detailed Monitoring Questionnaire Data Review

Detailed Monitoring Questionnaire data were evaluated using the same procedures outlined for the Detailed Questionnaire process. The QA/QC steps included reviews for: 1) completeness, 2) internal consistency, and 3) outliers.

Additional handling procedures for Detailed Monitoring Questionnaires were presented earlier in Section 4.4.

Table 4-2: Types of Facilities Included in EPA's Characterization and Engineering Site Visits

Ownership Type	Characterization Site Visits	Engineering Site Visits*
Municipal	4	9
Commerical	9	8
Non-Commercial (captive, intra-company)	2	1
Waste Type	Characterization Samples Collected	
Subtitle D	13	15
Subtitle C	5	3
Landfill Type	Characterization Samples Collected	
Subtitle D Non-Hazardous	10	15
(Municipal)	(2)	(14)
(Non-Municipal)	(8)	(1)
Subtitle C Hazardous	5	3
Groundwater	3	0

*One engineering site visit was conducted outside the U.S.

Table 4-3: Types of Facilities Included in EPA's Week-Long Sampling Program

Episode	Ownership Type			Waste Type		Landfill Subcategory		Treatment Technology
	Municipal	Commercial	Non-Commercial	Subtitle D	Subtitle C	Non-Hazardous	Hazardous	
4626	X			X		X		Equalization, chemical precipitation, biological treatment, filtration
4667	X			X		X		Equalization/stripper, chemical precipitation, biological treatment, GAC, filtration
4687	X			X		X		Equalization, filtration, reverse osmosis
4690			X		X		X	Air stripping* Steam stripping*
4721		X			X		X	Equalization, biological treatment
4759		X			X		X	Equalization, chemical precipitation, biological treatment

*Two separate treatment systems

5.0 INDUSTRY SUBCATEGORIZATION

In developing technology-based regulations for the Landfills industry, EPA considered whether a single set of effluent limitations and standards should be established for the industry, or whether different limitations and standards were appropriate for subcategories within the industry. The Clean Water Act (CWA) requires EPA, in developing effluent limitations, to assess several factors, including manufacturing processes, products, the size and age of a site, wastewater use, and wastewater characteristics. The Landfills industry, however, is not typical of many of the other industries regulated under the CWA that are manufacturing operations. Therefore, EPA developed additional factors that specifically address the characteristics of landfill operations. Similarly, several factors typically considered for subcategorization of manufacturing facilities were not considered applicable to the Landfills industry. The factors considered for the subcategorization of the Landfills industry are listed below:

- Resource Conservation and Recovery Act (RCRA) Regulatory classification
- Types of wastes received
- Wastewater characteristics
- Facility size
- Ownership
- Geographic location
- Facility age
- Economic impacts
- Treatment technologies and costs
- Energy requirements
- Non-water quality impacts

5.1 Subcategorization Approach

Based on assessment of the above factors, EPA has concluded that the most appropriate basis for subcategorization is by landfill classification under RCRA for the reasons explained in greater detail below. Subcategorization on this basis incorporates many of the most relevant differences within the Landfills industry. EPA found that the types of waste received at the landfill and the resulting characteristics of the wastewater are most clearly correlated with the RCRA classification of a landfill. Additionally, this subcategorization approach has the advantage of being the easiest to implement because it follows the same classification previously established by EPA under RCRA and currently in use (and widely understood) by permit writers and regulated landfills facilities.

5.2 Proposed Subcategories

EPA is proposing to subcategorize the Landfills industry into two subcategories as follows:

- Subcategory I: Subtitle D Non-Hazardous Landfills
- Subcategory II: Subtitle C Hazardous Landfills

Subcategory I applies to wastewater discharges from all facilities classified as RCRA Subtitle D Non-Hazardous landfills subject either to the criteria established in 40 CFR Part 257 or 40 CFR Part 258.

Subcategory II applies to wastewater discharges from solid waste disposal facilities classified as RCRA Subtitle C Hazardous landfills subject to the criteria in 40 CFR 264 Subpart N (Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities).

A discussion of the types of landfills regulated under these provisions of RCRA is presented in Chapter 3 (Section 3.1 - Regulatory History of the Landfills Industry).

5.3 Other Factors Considered for Basis of Subcategorization

Before deciding to propose subcategorization on the basis of the existing RCRA regulatory classification for the Landfills industry, EPA also evaluated the appropriateness of developing subcategories based on the other factors presented earlier in this chapter. The following subsections present EPA's evaluation of each of these factors.

5.3.1 Types of Wastes Received

The type of solid waste that is deposited in a landfill often has a direct correlation with the characteristics of the leachate produced by that landfill. Wastes deposited in landfills range from municipal, non-hazardous materials, to hazardous wastes containing contaminants such as pesticides. An analysis of the data collected as part of this study showed that there are differences in the wastewater generated by facilities that dispose of hazardous wastes as compared to non-hazardous wastes. These differences are reflected in both the number of pollutants of interest (as defined in Chapter 7) identified in each subcategory and in the concentrations of these pollutants found in the wastewaters generated. Tables presented in Chapters 6 and 7 of this document support this comparison. Specifically, the pollutant of interest list for the Non-Hazardous subcategory contains a total of 33 pollutants, whereas the pollutant of interest list for the Hazardous subcategory contains 63 pollutants. Pollutants targeted for analysis during EPA sampling episodes were detected approximately 47 percent of the time at hazardous facilities versus approximately 31 percent of the time at non-hazardous facilities. Organic pollutants and metals were routinely detected more frequently and at higher concentrations at hazardous landfills than at non-hazardous landfills.

EPA has determined that the most practical method of distinguishing the type of waste deposited in a landfill is achieved by utilizing the RCRA classification of landfills. As discussed in Section 5.1, the RCRA classification selected as the basis for subcategorization is based on the types of wastes received by the landfill: hazardous waste or non-hazardous waste. Therefore, types of waste disposed at a landfill is a factor which is taken into consideration by the fact that it is directly encompassed by the RCRA classification scheme and selected subcategorization method.

There also are a number of landfill cells and monofills within the Subtitle D class of non-hazardous landfills dedicated to accept only one type of waste which includes, but is not limited to, construction and demolition (C&D) debris, ash, or sludge. EPA is not proposing to further subcategorize Subtitle D landfill facilities. This decision is based on two considerations: (1) similarities in waste acceptance and leachate characteristics between monofills and other Subtitle D Non-hazardous landfills; and (2) ease of implementation. First, EPA evaluated leachate characteristics from Subtitle D landfills including monofills, ashfills, co-disposal sites, and construction and demolition (C&D) landfills. Table 5-1 includes data from three reports[1] which analyzed monofills and co-disposal sites and compares these data to the average influent data collected from non-hazardous landfills as part of the Landfills industry study. The data contained in these reports indicate that the leachate characteristics at construction and demolition, co-disposal and ash monofill facilities are comparable to the leachate characteristics from municipal solid waste landfills. Both the number and type of parameters in the leachate do not differ among these types of facilities, and concentration levels for all pollutants are comparable, with many parameters found at lower concentrations in the data from the construction and demolition, co-disposal and ash monofill facilities. Therefore, EPA has concluded that untreated leachate characteristics at these facilities were not significantly different than other non-hazardous landfill facilities to merit subcategorization.

This is not unexpected, as the waste deposited in municipal landfills and dedicated monofills is not mutually exclusive. Although cells at a dedicated landfill may prohibit disposal of municipal refuse, a municipal waste landfill may also accept ash, sludge, and construction and demolition wastes. EPA has determined that there were no pollutants of interest identified in untreated leachate from dedicated monofills that were not already present in municipal landfills. EPA concluded that the pollutants proposed to be regulated for the Non-hazardous Subtitle D subcategory will control the discharges from all types of Subtitle D landfills including monofills.

The second consideration was based on ease of implementation. As discussed in Section 5.2, the RCRA classification scheme selected as the basis for subcategorization clearly defines non-hazardous, hazardous, and municipal solid waste landfill facilities. However, RCRA does not make any further distinction nor further divide the Subtitle D landfill facilities based on whether they are monofills or if they receive multiple types of waste. Therefore, by further subcategorizing the Subtitle D facilities into monofills and multiple waste landfills a new classification scheme would

[1]"A Study of Leachate Generated from Construction and Demolition Landfills", Department of Environmental Engineering Sciences, University of Florida, August 1996; "Characterization of Municipal Waste Combustion Ashes and Leachates from Municipal Solid Waste Landfills, Monofills, and Co-Disposal Sites", U.S. EPA, EPA 530-SW-87-028D, October 1987; "Characterization of Municipal Waste Combustion Ash, Ash Extracts, and Leachates", U.S. EPA, EPA 530-SW-90-029A, March 1990.

be introduced to permit writers and regulated facilities. EPA concluded that the current RCRA classification scheme is widely understood by permit writers and regulated landfill facilities, therefore, making it the easiest of the subcategorization approaches to implement. Additionally, there are many facilities that operate both dedicated cells (similar to monofills) and municipal solid waste (MSW) cells at the same landfill and commingle the wastewaters prior to treatment. Establishing one subcategory for all non-hazardous landfills will ease implementation issues and adequately control discharges from the landfills industry.

5.3.2 Wastewater Characteristics

EPA concluded that leachate characteristics from non-hazardous and hazardous landfills differed significantly from each other in the types of pollutants detected and the concentrations of those pollutants. The tables supporting this conclusion are presented in Chapters 6 (Tables 6-7 through 6-11) and 7 (Tables 7-1 and 7-2) of this document. As expected, EPA found that the leachate from hazardous landfills contained a greater number of contaminants at higher concentrations compared to leachate from non-hazardous landfills. This conclusion supports subcategorization based on RCRA classification of hazardous and non-hazardous landfills.

In EPA's evaluation of contaminated groundwater, the wastewater characteristics of contaminated groundwater from hazardous landfills differed significantly from the contaminated groundwater characteristics at non-hazardous waste landfills, as shown in Table 5-2. Contaminated groundwater from non-hazardous landfills contained only 16 pollutants of interest (as defined in Chapter 7) compared to the contaminated groundwater from hazardous waste landfills which contained a total of 54 pollutants of interest. In addition, effluent data collected in support of this proposal demonstrate that contaminated groundwater flows at hazardous and non-hazardous facilities are, in general, adequately treated.

Due to the site-to-site variability of contaminated groundwater, EPA has decided that the treatment of these flows is best addressed through the corrective actions programs. Corrective actions programs at the federal, state, and local level have the ability to consider the site-to-site variability of the contaminated groundwater and provide the most applicable treatment necessary to control the contaminants. Therefore, EPA has decided to exclude contaminated groundwater from this regulation because the Agency believes that it is better controlled through corrective actions program.

Some landfill facilities collect and treat both landfill leachate and contaminated groundwater. Contaminated groundwater may be very dilute or may have characteristics similar in nature to leachate. In cases where the groundwater is very dilute, it is possible that contaminated groundwater may be used as a dilution flow. In these cases, the permit limits will be based on separate treatment of the flows in order to prevent dilution of the regulated leachate flows. However, in cases where the groundwater may exhibit characteristics similar to leachate, commingled treatment is appropriate and may be more cost effective than separate treatment. The characteristics of the contaminated groundwater must be considered before making a determination if commingling groundwater and leachate for treatment is appropriate.

5.3.3 Facility Size

EPA considered subcategorization of the Landfills industry on the basis of facility size and found that landfills of varying sizes generate similar wastewaters and use similar treatment technologies. Based upon a review of the industry provided data in the landfills database, there was no observed correlation between waste acceptance amount or wastewater flow rate and the selection of treatment technologies. For example, a landfill facility can add cells or increase its waste receipt rate depending on the local market need without altering or changing the characteristics of the wastewaters generated. In addition, the size of a landfill was not determined to be a factor in cost-effectiveness of the regulatory options considered by EPA. Finally, EPA has determined wastewaters from landfills can be treated to the same level regardless of facility size. EPA has not proposed a de-minimis flow exemption for this guideline; however, EPA has accounted for landfill facilities that generate small volumes of wastewater by estimating compliance costs for the proposed BPT/BAT/PSES options based on treating their wastewaters off-site at a CWT facility (see Section 9.2.2).

5.3.4 Ownership

EPA considered subcategorizing the industry by ownership. A significant number of landfills are owned by state, local, or federal governments, while others are commercially or privately owned. Landfills generally fall into two major categories of ownership: municipal or private. Landfills owned by municipalities are primarily designed to receive non-hazardous solid waste such as municipal waste, non-hazardous industrial waste, construction and demolition debris, ash, and sludge. However, municipally-owned landfills may also be designed to accept hazardous wastes.
Privately-owned landfills can also provide for the disposal of non-hazardous solid waste such as those mentioned above, and, like municipally-owned facilities, may also be designed to accept hazardous wastes. EPA found that currently commercially- and municipally-owned landfills generally accept and manage wastes strictly by the RCRA classification and, although there are distinct economic differences, there is no distinction in the wastewater characteristics and wastewater treatment employed at commercially- or municipally-owned landfills. Since all landfill types could be of either ownership status, EPA determined that subcategorization based upon municipal and private ownership was not appropriate.

5.3.5 Geographic Location

EPA considered subcategorizing the industry by geographic location. Landfill sites are not limited to any one region of the United States. A table presenting the number of landfills by state is presented in Chapter 3 (Table 3-1). While landfills from all sections of the country were included in the Agency's survey efforts, collection of wastewater characterization data as part of EPA's sampling episodes was limited to landfill facilities in the Northeast, South, and Midwest, where annual precipitation is either average or above average. Although wastewater generation rates appear to vary with annual precipitation, which is indirectly related to geographic location, a direct correlation between leachate characteristics and geographic location could not be established due to lack of sampling data from arid parts of the United States. However, the Agency believes that seasonal variations in rainfall cause only minor fluctuations in leachate characteristics due to dilution effects and volume of leachate generated. In addition, many landfill facilities have developed site-specific best management practices to control the amount of rainwater that enters a landfill and eventually becomes part of the leachate. These practices include proper contouring of landfill cells, extensive use of daily cover, and capping of inactive landfill cells in order to minimize the amount of uncontaminated rainwater that enters the landfill. EPA's data collection efforts indicate that landfill facilities in less arid climates are more likely to use these management practices to control their wastewater generation and flows to the on-site wastewater treatment plant. The data collected by EPA did not indicate any significant variations in wastewater treatment technologies employed by facilities in colder climates versus warmer climates.

EPA notes that geographic location may have a differential impact on the costs of operating a landfill. For example, the cost of additional equipment required for the operation of the landfill or treatment system or tipping fees charged for the hauling of waste may tend to differ from region to region. These issues were addressed in the economic impact assessment of the proposal.

Therefore, since the effect of geographic location appears to have a minimal impact on wastewater characteristics or can be easily addressed at minimal effort and cost, EPA determined that subcategorization based upon geographic location was not appropriate.

5.3.6 Facility Age

EPA considered subcategorization based on the age-related changes in leachate concentrations of pollutants for different age classes of landfills based on the evaluation of several factors. First, a facility's wastewater treatment system typically receives and commingles leachate from several landfills or cells of different ages. The Agency did not observe any facility that found it advantageous or necessary to treat age-related leachates separately. Additionally, the EPA did not find any correlation between the relative ages of the landfills and the method of leachate treatment. Second, based on responses to the questionnaire, discussions with landfill operators, and historical data, it appears that leachate pollutant concentrations change substantially over the first two to five years of a landfill's operation, but then change only slowly thereafter.

These two observations imply that landfill treatment systems must be designed to accommodate the full range of concentrations and pollutants expected in influent wastewaters. EPA has concluded that the proposed BPT/BAT/PSES treatment technologies can successfully treat the variations in landfill wastewaters likely to occur due to age-related changes in the leachate. EPA also has taken into account the ability of treatment systems to accommodate age-related changes in raw leachate concentrations and pollutants, as well as short-term fluctuations, by proposing effluent limitations (for those regulated pollutants having long term sampling data) that reflect the variability observed in monitoring data spanning 12 to 36 months. Additionally, age-related effects on treatment technologies, costs, and pollutant loads were addressed by utilizing data collected from a variety of landfills of various ages and types of operation (e.g., closed/capped, inactive, or active).

EPA also evaluated sampling data collected from hazardous and non-hazardous landfill facilities of different ages to compare general leachate characteristics based on conventional and selected nonconventional pollutant parameters, as shown in Table 5-3. While certain pollutant parameters follow the generally accepted pattern of younger landfills having leachates with higher pollutant concentrations, as shown for TOC and TSS for both municipal and hazardous facilities, data for other parameters such as COD for the hazardous facilities and BOD for the municipal facilities show the opposite trend. However, in general, these pollutant concentrations are within the same order of magnitude and the Agency believes that this variability in wastewater characteristics can be adequately handled in the proposed BPT/BAT/PSES treatment options.

Based on this analysis of the effects of age on wastewater characteristics, EPA determined that subcategorization based on facility age is not appropriate.

5.3.7 Economic Characteristics

EPA also considered subcategorizing the industry based on the economic characteristics of the landfill facilities. If a group of facilities with common economic characteristics, such as revenue size, was in a much better or worse financial condition than others, EPA could consider subcategorization on economics. However, based on the results of the detailed questionnaires, financial conditions of compliance costs associated with the proposed BPT/BAT/PSES regulations did not inordinately effect any particular segment of the landfills industry. Therefore, EPA determined that subcategorization based on the economic characteristics of landfills facilities was not justified.

5.3.8 Treatment Technologies and Costs

Wastewater treatment for this industry ranges from primary systems such as equalization, screening, and settling, to advanced tertiary treatment systems such as filtration, carbon adsorption, and membrane separation. EPA found that the selected treatment technology employed at a facility was dependent on wastewater characteristics and permit requirements. Landfills with more complex mixtures of toxic pollutants in their wastewaters generally had more extensive treatment systems and may utilize several treatment processes (e.g., facilities with high levels of both organic and inorganic pollutants may employ both a chemical and biological treatment system). However, subcategorizing by the waste type received by a landfill as outlined in the RCRA classification of landfills is less difficult to implement and results in addressing the same factors as using treatment processes employed. As a result, EPA did not consider treatment technologies or costs to be a basis for subcategorization.

5.3.9 Energy Requirements

The Agency did not subcategorize based on energy requirements because energy usage was not considered a significant factor in this industry and is not related to wastewater characteristics. Energy costs resulting from this regulation were accounted for in the costing section of this development document (Chapter 9) and in the economic impact assessment.

5.3.10 Non-Water Quality Impacts

The Agency evaluated the impacts of this regulation on the potential for increased generation of solid waste and air pollution. The non-water quality impacts did not constitute a basis for subcategorization. Non-water quality impacts and costs of solid waste and air pollution control are included in the economic analysis and regulatory impact analysis for this regulation. See Chapter 10 for more information regarding non-water quality impacts.

Table 5-1: Subtitle D Non-Hazardous Landfill Data Comparison (ug/l)

Pollutant	C & D Study		EPA Characterization Studies - Data Range			Subtitle D Non-Hazardous Master File		
			1990	1987				
Metals	Mean [(1)]	Facilities Det/Total[(2)]	Monofills	Co-Disposal	Monofills	Median	Mean	Max
Arsenic	12.3	12/16	ND(50) - 400	8 - 46	10 - 218	32.4	50.4	179
Barium	661	13/13	ND(2) - 9,220	270 - 890	NA	650	849	3,570
Boron	NA	NP	NA	NA	NA	2,523	3,874	16,250
Chromium	NA	NP	ND(7) - 32	ND(10) - 13	5 - 914	28	47	240
Hexavalent Chromium	NA	NP	NA	NA	NA	30	63	234
Molybdenum	NA	NP	NA	NA	NA	10	27	69
Silicon	NA	NP	470 - 15,300	NA	NA	7,283	28,817	159,000
Strontium	NA	NP	NA	NA	NA	2,525	5,160	30,100
Titanium	NA	NP	NA	NA	NA	28	162	1,740
Zinc	658	15/15	5.2 - 370	9 - 1,210	48 - 3,300	100	1,183	31,813
Organics								
1,4-Dioxane	49	1/5	NA	NA	NA	11	118	323
2-Butanone	NA	NP	NA	NA	ND(50)	1,768	5,874	36,544
2-Propanone	NA	NP	NA	NA	ND(50)	184	1,396	8,614
4-Methyl-2-Pentanone	130	2/8	NA	NA	ND(50)	100	3,789	46,161
Alpha-Terpineol	NA	NP	NA	NA	ND(50)	123	334	1,061
Benzoic Acid	15,457	4/9	ND(50) - 73	NA	ND(50)	3,897	8,423	33,335
Dichloroprop	NA	NP	NA	NA	ND(50)	6	10	29
Disulfoton	3.3	2/4	NA	NA	NA	6	9	20
Hexanoic acid	NA	NP	NA	NA	ND(50)	65	621	4,291
MCPA	NA	NP	NA	NA	NA	403	816	4,370
MCPP	NA	NP	NA	NA	NA	233	432	1,900
Methylene Chloride	26.4	4/9	NA	NA	ND(50)	37	309	5,091
N,N-Dimethylformamide	NA	NP	NA	NA	ND(50)	10	214	1,008
O-Cresol	50	2/8	NA	NA	ND(50)	15	298	2,215
Phenol	384	3/6	ND(10) - 32	ND(50) - 2,100	ND(1.5)	102	287	1,425
P-Cresol	NA	NP	NA	NA	ND(50)	75	246	998
Toluene	61	7/9	NA	ND(50) - 120	ND(50)	108	156	598
Tripropyleneglycol Methyl Ether	NA	NP	NA	NA	ND(50)	197	568	1,235

Table 5-1: Subtitle D Non-Hazardous Landfill Data Comparison (ug/l)

Conventional/Nonconventionals								
BOD	87,320	14/14	NA	NA	NA	173,069	993,869	7,609,318
COD	754,500	16/17	NA	1,300,000 - 3,900,000	5 - 1,200,000	1,100,000	2,259,142	16,700,000
Ammonia Nitrogen	20,420	16/78	4,380 - 77,400	160,000 - 410,000	1,200 - 36,000	75,000	372,485	5,860,000
TDS	2,263,100	17/18	924,000 - 41,000,000	NA	NA	3,246,076	5,979,674	33,900,000
TSS	1,859,100	17/18	NA	1,930,000 - 7,970,000	NA	106,000	1,092,879	1,650,000
Total Phenols	620	7/7	NA	NA	NA	473	94,934	2,051,249
Nitrate/Nitrite	NA	NP	NA	NA	NA	700	5,457	50,800
TOC	306,540	7/7	17 - 420,000	438,000 - 1,310,000	59,100 - 636,000	295,000	684,055	4,820,000
Dioxins/Furans								
1234678-HpCDD	NA	NP	ND(NV) - 0.222(2)	0.12 - 0.77(2)	0.009 - 172(2)	0.14	2.42	7.08
OCDD	NA	NP	ND(NV) - 0.107	0.21 - 15	0.06 - 120	0.10	9.84	82.4

All units in ug/l unless otherwise noted
*: The number of sites that detected the parameter/the total number of sites that sampled the parameter
(1): Mean includes non-detects for metals and conventionals/nonconventionals and does not include non-detects for organics and dioxins/furans
(2): Total homolog concentration
NA: Not Analyzed
ND: Not Detected
NV: Not Available
NP: Not Applicable

Table 5-2

Hazardous Groundwater Results (ug/l)

HAZARDOUS SUBCATEGORY

				QID	QID	QID	QID	QID		QID		QID			QID	QID		QID16144			
	Groundwater			16018	16031	16032	16034	16036		16094		16095			16136	16141		E4690			
	Pollutant of Interest	Cas #	MDL	Inf	Eff	Eff	Inf	Inf		Eff		Inf	Eff		Inf	Eff		Inf		Eff	
	1,1-Dichloroethane	75243	10		2		230	113				89	5	ND				121522		10	
	1,1,1-Trichloroethane	71556	10		5		180	185		1	ND	370	5	ND				37598		10	
	1,1,2,2-Tetrachloroethane	79345	10					0.5	ND	1	ND							218139		445	
	1,2,4-Trichlorobenzene	120821	10															265		19	ND
	1,2-Dichlorobenzene	95501	10							1	ND							10491		19	ND
	1,2-Dichloroethane	107062	10		2			4		1	ND							1E+06		357	
	1,2,3-Trichloropropane	96184	10															1E+06		138	
	1,3-Dichlorobenzene	541731	10															16628		19	ND
	1,4-Dichlorobenzene	106467	10							1	ND							25655		19	ND
	1,4-Dioxane	123911	10				46											6429		3738	
	2,4-Dichlorophenol	120832	10															101		109	ND
	2378-TCDD	1746016	1E-05															0.0002			
	2378-TCDF	5E+07	1E-05															0.0066			
	2,4,5-T	93765	0.2															5			
	2,4,5-TP	93721	0.2															2			
	2-Propanone	67641	50															25424		446	
	Ammonia as Nitrogen	7664417	10															27444		17760	
	Arsenic	7440382	10													50	ND	80		13	
	Benzene	71432	10	520	1										4606			37922		10	
	Benzoic Acid	65850	50															1330		1920	
	Benzyl Alcohol	100516	10															298		282	
	Bis(2-chloroethyl)ether	111444	10															16518		34716	
	Bis(2-ethylhexyl)phthalate	117817	10															1039		19	ND
	BOD	C-002	2000			2700												86500		55230	
	Boron	7440428	100															846		770	
	Cadmium	7440439	5													3	ND	9		8	
	Chlorobenzene	108907	10	920	2					1	ND							12936		10	
	Chloroform	67663	10		2													132025		32	
	COD	C-004	5000			23600												6E+06		2E+06	
	Copper	7440508	25															53		521	
	Dalapon	75990	0.2															109			
	Dicamba	1918009	0.2															34			
	Dichlorvos	62737	5															236			
	Dinoseb	88857	0.5															14			
	Dioxathion	78342	5															270			
	Ethyl Benzene	100414	10	372	2													14694		10	
	Hexane Extractable Material	C-036	5000															2E+06		8750	
	Hexanoic Acid	142621	10															16368		28013	
	Lithium	7439932	100															305		219	
	Methylene Chloride	75092	10		2													123572		40	

Table 5-2

Hazardous Groundwater Results (ug/l)

HAZARDOUS SUBCATEGORY

Groundwater			QID	QID	QID	QID	QID	QID		QID			QID	QID		QID16144		
			16018	16031	16032	16034	16036	16094		16095			16136	16141		E4690		
Pollutant of Interest	Cas #	MDL	Inf	Eff	Eff	Inf	Inf	Eff		Inf	Eff		Inf	Eff		Inf	Eff	
Molybdenum	7439987	10														13	13	
Naphthalene	91203	10				54							4100			3766	19	ND
Nickel	7440020	40												10		136	1462	
Nitrate/Nitrite	C-005	50												1000	ND	2136	1571	
Pentachlorobenzene	608935	20														4333	38	ND
Phenol	108952	10														6029	1537	
Silicon	7440213	100														6738	6602	
Strontium	7440246	100														17156	12360	
TOC	C-012	1000														2E+06	730700	
Toluene	108883	10	573	2						19	5	ND	2573			22080	10	
Trans-1,2-Dichloroethene	156605	10		5				1	ND							84660	14	
Trichloroethene	79016	10		5			5									272606	33	
TSS	C-009	4000												37000		121639	26450	
Zinc	7440666	20				120										576	3451	

MDL: Method detection limit
QID: Questionnaire ID
E: Sampling episode
ND: Non-detect with respect to instrument detection limit (IDL)
*: IDL is greater than detected value

Table 5-2 (continued)

Non-Hazardous Groundwater Results (ug/l)

NON-HAZARDOUS SUBCATEGORY

Groundwater			E4683		QID 16016		QID16085 E4685				QID16088 E4684				QID 16129				QID 16132		QID 16163	
Pollutant of Interest	Cas #	MDL	Inf		Eff		Inf		Eff		Inf		Eff		Inf		Eff		Eff		Eff	
1,1-Dichloroethane	75243	10	10	ND	0.3	ND	5.5				8.6		1		22				0.35	ND	4	ND
1,1,1-Trichloroethane	71556	10	10	ND	0.5	ND	1.4	ND			2.1		1	ND	17				0.45	ND	5	ND
1,2-Dichloroethane	107062	10	10	ND	0.3	ND	1.4	ND			2.1	ND	1	ND	15				0.35	ND	8	
2,4,5-T	93765	0.2	0.2	ND			0.2	ND			2				1	ND						
2,4,5-TP	93721	0.2	0.2	ND	2000	ND	0.2	ND			5				1.9	ND						
2-Propanone	67641	50	50	ND	10.5		50	ND			50	ND			742				1.3			
Ammonia as Nitrogen	7664417	10	1340				1284		256		1300		409		80551		563					
Arsenic	7440382	10	2	ND	16		4.3				3		2		13				11		25	
Benzene	71432	10	10	ND	0.3	ND	1.4	ND	5.7		2.2		1	ND	13				0.35	ND		
Benzyl Alcohol	100516	10	10	ND			10	ND			10	ND			19							
BOD	C-002	2000	14000		1000		1000	ND	751		1000	ND			2E+05		1835					
Boron	7440428	100	173				362				97				1091							
Cadmium	7440439	5	4	ND	18		0.4		19		4	ND	15		5	ND			3.8		2	
Chlorobenzene	108907	10	10	ND	0.5	ND	1.4	ND			2.1	ND	1.5	ND	12				0.35	ND	5	ND
Chloroform	67663	10	10	ND	0.5	ND	1.7				2.1	ND	1	ND	15							
COD	C-004	5000	28000		21637		51000				14000										33300	
Copper	7440508	25	12		38		10	ND			10	ND			53		121		10		2.5	
Dalapon	75990	0.2	0.2	ND			0.2	ND			6											
Dicamba	1918009	0.2	0.2	ND			0.2	ND			10											
Dinoseb	88857	0.5	0.5	ND			0.5	ND			3				50	ND						
Ethyl Benzene	100414	10	10	ND	0.3	ND	1.4	ND			2.1	ND	1	ND	15				0.35	ND	5	ND
Methylene Chloride	75092	10	10	ND	1		3.3	ND			2.1	ND	3.5	ND	49		0.6		0.45			
Naphthalene	91203	10	10	ND	36	ND	10	ND			10	ND			12							
Nickel	7440020	40	14	ND	30		59				14	ND	27		45		21		16		40	
Nitrate/Nitrite	C-005	50	2660				1300				1340										10000	ND
Phenol	108952	10	10	ND	54.5	ND	5718	ND			10	ND			145							
Silicon	7440213	100	3530				3880				3270											
Strontium	7440246	100	201				657				200											
TOC	C-012	1000	10000	ND			40000				10000	ND							3996			
Toluene	108883	10	10	ND	0.3	ND	1.4	ND			2.1	ND	1	ND	47				0.35	ND	5	ND
Trans-1,2-Dichloroethene	156605	10	10	ND	0.3	ND	2.8		5.7		3.6		1	ND	38		0.5	ND	0.35	ND	5	ND
Trichloroethene	79016	10	10	ND	0.35		10	ND			2.1	ND	1	ND	19		0.5		0.45		1	
TSS	C-009	4000	4000	ND			24000		5593		4000	ND			43848		2651					
Zinc	7440666	20	15.2		35		70				16				82		24					

MDL: Method detection limit
QID: Questionnaire ID
E: Sampling episode
ND: Non-detect with respect to instrument detection limit (IDL)
*: IDL is greater than detected value

Table 5-3: Comparision of Untreated Wastewater Charcteristics at Landfills of Varying Age

	Subtitle D Non-Hazardous Municipal		Subtitle C Hazardous	
	Year Landfill Began Accepting Waste		Year Landfill Began Accepting Waste	
Analyte (mg/l)	1971	1986	1968	1980
Ammonia	245	192	460	557
BOD5	1290	1073	955	4250
COD	201	472	2400	1920
TOC	657	1526	799	5850
TSS	200	657	31	111

Note: Samples collected during EPA sampling episodes 1994-95

6.0 WASTEWATER GENERATION AND CHARACTERIZATION

In 1994, under the authority of Section 308 of the Clean Water Act (CWA), the Environmental Protection Agency (EPA) distributed the "Waste Treatment Industry Questionnaire Phase II: Landfills" to 252 facilities that EPA had tentatively identified as possible generators of landfill wastewater. Some of the facilities employed on-site wastewater treatment, others did not. These facilities were selected for survey purposes to represent a total of 1,024 potential generators of landfill wastewater. A total of 220 questionnaire respondents generated landfill leachate in 1992. This section presents information on wastewater generation at these facilities based on the questionnaire responses. In addition, this section also summarizes the information on wastewater characteristics for landfill facilities that were sampled by EPA and for those facilities that provided self-monitoring data.

6.1 Wastewater Generation and Sources of Wastewater

Landfill facilities do not generate "process wastewater" as defined in 40 CFR 122.2 as "any water which, during manufacturing or processing, comes into direct contact with or results from the production or use of any raw material, by-product, intermediate product, finished product or waste product" in the traditional sense. This definition of process wastewater is used for manufacturing or processing operations; since landfill operations do not include or result in "manufacturing processes" or "products", EPA refers to the wastewater treated at landfill facilities as landfill generated wastewaters.

In general, the types of wastewater generated by activities associated with landfills and collected for treatment, discharge, or reuse are: leachate, landfill gas condensate, truck/equipment washwater, drained free liquids, laboratory derived wastewaters, floor washings, recovering pumping wells, contaminated groundwater, and storm water runoff. For the purposes of the Landfill industry study, all of these wastewater sources are considered "in-scope" except for contaminated groundwater and non-contaminated storm water.

In 1992, approximately 23 billion gallons of wastewater was generated at landfill facilities. Approximately 7.1 billion gallons of this wastewater is considered “in-scope”. The remaining 15.9 billion gallons of wastewater generated at landfills consists of contaminated groundwater and non-contaminated storm water. The primary sources of wastewater at landfills are defined below.

Landfill leachate as defined in 40 CFR 258.2, is liquid that has passed through or emerged from solid waste and contains soluble, suspended, or miscible materials removed from such waste. Over time, the seepage of water through the landfill as a result of precipitation may increase the mobility of pollutants and thereby increase the potential for their movement into the wider environment. As water passes through the layers of waste, it may “leach” pollutants from the disposed waste. This mobility may present a potential hazard to public health and the environment (e.g., groundwater contamination). One measure used to prevent the movement of toxic and hazardous waste constituents from a landfill is a landfill liner operated in conjunction with a leachate collection system. Leachate is typically collected from a liner system placed at the bottom of the landfill. Leachate also may be collected through the use of slurry walls, trenches, or other containment systems. The leachate generated varies from site to site based on a number of factors including the types of waste accepted, operating practices (including shedding, daily cover and capping), the depth of fill, compaction of wastes, annual precipitation, and landfill age. Landfill leachate accounts for over 95 percent of the total volume of in-scope wastewaters.

Landfill gas condensate is a liquid which has condensed in the landfill gas collection system during the extraction of gas from within the landfill. Gases such as methane and carbon dioxide are generated due to microbial activity within the landfill and must be removed to avoid hazardous conditions. The gases tend to contain high concentrations of water vapor which is condensed in traps staged throughout the gas collection network. The gas collection condensate contains volatile compounds and typically accounts for a small portion of flow from a landfill.

Truck/equipment washwater is generated during either truck or equipment washes at landfills. During routine maintenance or repair operations, trucks and/or equipment used within the landfill (e.g., loaders, compactors, or dump trucks) are washed and the resultant washwaters are collected for treatment. In addition, it is common practice in hazardous landfills to wash the wheels, body, and undercarriage of trucks used to deliver the waste to the open landfill face upon leaving the landfill. On-site wastewater treatment equipment and storage tanks also are cleaned periodically and their associated washwaters are collected. Floor washings generated during routine cleaning and maintenance of the facility also are collected for treatment.

Drained free liquids are aqueous wastes drained from waste containers (e.g., drums, trucks, etc.) or wastewater resulting from waste stabilization prior to landfilling. Landfills that accept containerized waste may generate this type of wastewater. Drained free liquids are collected and usually combined with other landfill generated wastewaters for treatment at the wastewater treatment plant.

Laboratory-derived wastewater is generated from on-site laboratories which characterize incoming waste streams and monitor on-site treatment performance. This source of wastewater is minimal and is usually combined with leachate and other wastewaters and treated at the wastewater treatment plant.

Contaminated storm water is runoff that comes in direct contact with the solid waste, waste handling and treatment areas, or wastewater flows that are covered under this rule. Storm water that does not come into contact with these areas was not considered to be within the scope of this study.

Landfill operations also generate and discharge wastewaters that are considered out of the scope of the proposed regulation. These sources include contaminated groundwater and non-contaminated storm water. The exclusion of these flows is discussed in Chapter 2: Scope of the Regulation. A brief description of these wastewaters is presented below.

Contaminated groundwater is water below the land surface in the zone of saturation that has been contaminated by landfill leachate. Contaminated groundwater occurs at landfills without liners or at facilities that have released contaminants from a liner system and is then collected and treated by landfills. Groundwater also can infiltrate the landfill or the leachate collection system if the water table is high enough to penetrate the landfill area.

Non-contaminated (non-contact) storm water includes storm water that flows off the cap or cover of the landfill and does not come in direct contact with solid waste, waste handling and treatment areas, or wastewater flows which are covered under this rule.

These landfill generated waste streams are considered out of the scope of the landfills regulations for the following reasons. EPA found that pollutants in contaminated groundwater flows are treated to very low levels prior to discharge. Therefore, it was concluded that, whether as a result of corrective action measures taken pursuant to Resource Conservation and Recovery Act (RCRA) authority or State action to clean up contaminated landfill sites, landfill discharges of treated contaminated groundwater are being adequately controlled, and that further regulation under this proposed rule would be redundant and unnecessary. As for non-contaminated storm water, this runoff includes storm water that flows off the cap or cover of the landfill and does not come in direct contact with the waste. Therefore, this wastewater is considered out of the scope of landfill regulation because it is already covered by other EPA regulations.

Many landfill facilities, particularly hazardous landfills, commingle waste streams such as contaminated groundwater, non-contaminated storm water, or process wastewater from on-site industrial operations with in-scope landfill generated wastewaters prior to or after treatment. These out-of-scope waste streams are not included as wastewater sources reviewed for effluent limitations guidelines and standards for this rulemaking. The flow monitoring data received from facilities with commingled waste streams were reviewed to determine if the discharge streams included out-of-scope wastewater. In cases where the waste streams included greater than 15 percent out-of-scope wastewater, the monitoring data were not used to characterize landfill generated wastewater.

6.2 Wastewater Flow and Discharge

Tables 6-1 and 6-2 present national estimates of the flows for primary wastwater sources found at landfills reported in Section A of the Waste Treatment Industry 308 Questionnaire Phase II: Landfills. A brief discussion of national estimates and how these estimates are calculated is presented in Chapter 3, Section 3.2.1. The flows in both tables are reported by subcategory: Non-Hazardous (broken down into Subtitle D municipal solid waste and non-municipal solid waste facilities) and Hazardous; and by discharge type: direct, indirect, and zero.

Direct discharge facilities are those that discharge their wastewaters directly into a receiving stream or body of water. Based on national estimates, there were no direct discharging hazardous landfills identified in the Landfills industry study; therefore, this discharge type has been omitted from the Hazardous subcategory on Table 6-1 and is reported as a zero on Table 6-2. Indirect discharging facilities discharge their wastewater indirectly to a publicly-owned treatment works (POTW). Zero or alternative discharge facilities use treatment and disposal practices that result in no discharge of wastewater to surface waters. Disposal options for landfill generated wastewater include off-site treatment at another landfill wastewater treatment system or a Centralized Waste Treatment facility, deep well injection, incineration, evaporation, land application, and recirculation back to the landfill.

Table 6-1 presents wastewater flows by subcategory and discharge type for the different types of wastewater generated by landfills in 1992. Total flows are reported for wastewaters treated on-site and off-site, discharged untreated to a POTW or surface water, and recycled flows that are put back into the landfill. Wastewater flows identified as "Other" treatment include evaporation, incineration, or deep well injection. The national estimates presented in Tables 6-1 and 6-2 are based on 176 of the 220 facilities that generate and treat landfill leachate; the remaining 44 facilities are excluded from the proposed landfill regulation as discussed in Chapter 2.

In-scope wastewater flows from Table 6-1 were combined and presented in Table 6-2. Table 6-2 does not include out-of-scope flows from contaminated groundwater or storm water. National estimates are presented for the in-scope wastewater flows and the associated number of non-hazardous and hazardous facilities by subcategory and discharge type.

6.2.1 Wastewater Flow and Discharge at Subtitle D Non-Hazardous Landfills

Approximately 6.7 billion gallons of in-scope wastewater were generated at non-hazardous landfills in 1992. Flows collected from leachate collection systems are the primary source of wastewater, accounting for over 98 percent of the in-scope wastewaters generated at non-hazardous landfills.

Landfill facilities have several options for the discharge of their wastewaters. EPA estimates that there are 158 Subtitle D non-hazardous facilities discharging wastewater directly into a receiving stream or body of water, accounting for 1.2 billion gallons per year. In addition, there are 762 facilities discharging wastewater indirectly to a POTW, accounting for 4.5 billion gallons per year.

Also, there are a number of facilities which use treatment and disposal practices that result in no discharge of wastewater to surface waters. The Agency estimates that there are 343 of these zero or alternative discharge facilities. Several zero discharge or alternative facilities in the Non-Hazardous subcategory recycle wastewater flows back into the landfill. The recirculation of leachate is generally believed to encourage the biological activity occurring in the landfill and accelerate the stabilization of the waste. The recirculation of landfill leachate is not prohibited by federal regulations, although many states have prohibited the practice. EPA estimates that 349 million gallons per year are recirculated back to Subtitle D non-hazardous landfill units.

6.2.2 Wastewater Flow and Discharge at Subtitle C Hazardous Landfills

Approximately 367 million gallons of in-scope wastewater were generated at hazardous landfills in 1992. Flows collected from leachate collection systems are the primary source of wastewater, accounting for approximately 74 percent of the in-scope wastewaters generated at hazardous landfills, and 24 percent of the flows are generated by routine maintenance activities such as truck/equipment washing and floor washing.

Landfill facilities have several options for the discharge of their wastewaters. EPA's survey of the Landfills industry did not identify any hazardous landfills covered by the proposed guideline which discharge in-scope wastewaters directly to surface waters. EPA estimates that there are 6 facilities discharging wastewater indirectly to a POTW, accounting for 40 million gallons per year.

The Agency estimates that 141 hazardous landfill facilities use zero or alternative discharge disposal options. EPA estimates that 103 facilities ship wastewater off-site for treatment, often to a treatment plant located at another landfill or to a Centralized Waste Treatment facility. Shipping off-site accounts for 9 million gallons per year of wastewater. Another 37 facilities use underground injection for disposal of their wastewaters, accounting for 312 million gallons per year; and 1 facility solidifies less than 0.1 million gallons per year of landfill wastewater.

6.3 Wastewater Characterization

The information reported in this section was collected through the EPA sampling program and data supplied by the Landfills industry via technical questionnaires. EPA sampling programs consisted of five-day events at landfills with selected BAT treatment systems (where the raw leachate and treatment system points were sampled) as well as one-day events to characterize raw leachate quality at selected types of landfill facilities. Industry provided data, as supplied in the Detailed Questionnaire and in the Detailed Monitoring Questionnaire responses, were also used to characterize landfill generated wastewaters. In addition, data collected as part of the Centralized Waste Treatment Industry study (see reference 31) and Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) groundwater study (see reference 25) were used in the characterization of the wastewaters from hazardous landfill facilities. These data sources are discussed in detail in Chapter 4 as well as the QA/QC procedures and editing rules used to evaluate these data. The raw wastewater Master File then was developed for each subcategory by combining the influent data from all of the available data sources to characterize the raw wastewater by subcategory.

This section presents background information on the types of wastewaters generated at landfill facilities and the factors that affect the wastewater characteristics, pollutant parameters analyzed and detected at EPA sampling episodes, the methodology for developing the Master File, and the pollutant parameters identified in typical landfill generated wastewaters along with the minimum and maximum concentrations of these pollutants. This section also presents available literature data on the wastewater characteristics of Non-Hazardous subcategory landfill generated wastewaters.

6.3.1 Background Information

Landfill generated wastewaters are composed of several wastewater sources that have been discussed in Section 6.1, including landfill leachate, landfill gas condensate, truck/equipment washwater, drained free liquids, laboratory-derived wastewater, floor washings, recovering pumping wells, contaminated groundwater, and storm water runoff. Wastewaters within the scope of the proposed landfill regulation include the above mentioned sources with the exception of contaminated groundwater and non-contaminated storm water. The primary sources of in-scope landfill generated wastewater are discussed below.

6.3.1.1 Landfill Leachate

Leachate is the liquid which passes through or emerges from solid waste, and contains soluble, suspended, or miscible materials removed from such waste. Leachate quality is affected by several factors that vary depending on each individual landfill, including:

- types of waste accepted/deposited
- operating practices (shredding, cover, and capping)
- amount of infiltration
- depth of fill
- compaction
- age

Waste types received for disposal are the most representative characteristic of a landfill and, therefore, of the wastewater generated, since the main contaminants in the wastewater are derived from the materials deposited into the fill (see Chapter 5: Industry Subcategorization). Infiltration and age primarily affect the concentration level of contaminants in the leachate. The remaining factors mainly influence the rate of infiltration.

Characterization of landfill leachate is a function of both the concentration of contaminants in the leachate and the volume of leachate generated. On a relative basis, the highest concentrations of contaminants are typically present in the leachates of new or very young landfills. However, the amount (i.e., the mass) of pollutants are not necessarily the highest in the life of a landfill because new landfills generally generate low volumes of leachate. As the volume of waste approaches the field capacity of the landfill and the production of leachate increases, both the pollutant loadings (mass x concentrations) and the concentrations of certain contaminants (mostly organic pollutants) increase. The concentration increase is attributed to the onset of decomposition activities within the landfill and to the leachate traversing the entire depth of refuse. Therefore, the largest expected loadings of contaminants from a typical landfill result during a period of high leachate production and high contaminant levels (see reference 13). The exact periods of varying leachate production cannot be quantified readily but are site-specific and dependent on each of the above variables.

Over a period of time (as the landfill ages and leaching continues) the concentration of contaminants in the leachate decreases (see reference 13). Substantial quantities of leachate may continue to be produced by the landfill; however, loadings are lower due to the lower concentrations of contaminants remaining in the landfill. As decomposition of the landfill continues, a stabilized state of equilibrium is attained where further leaching produces leachate with lower loadings than during the period of peak leachate production. This stabilized state is presumably the result of decomposition of landfill waste by indigenous microorganisms, which will remove many of the contaminants usually susceptible to further leaching.

Biological decomposition of landfill municipal refuse has been examined by many researchers and has been modeled after the anaerobic breakdown of other organic wastes. The following discussion of the decomposition process has been adapted from a report on the characteristics of landfill leachate prepared by the Wisconsin Department of Natural Resources (see reference 13).

Biological activity occurs in a landfill shortly after deposition of organic material. At first, wastes high in moisture content decompose rapidly under aerobic conditions, creating large amounts of heat. As oxygen is depleted, the intermediate anaerobic stage of decomposition begins. This change from aerobic to anaerobic conditions occurs unevenly through the landfill and depends upon the rate of oxygen diffusion in the fill layers. The first stage of anaerobic decomposition converts complex organic wastes to soluble organic molecules. This solubilization is performed by extracellular enzymes. Once the organics are solubilized, the second stage of anaerobic decomposition converts them to simple organic molecules, the most common of which are organic acids (such as acetic, propionic, and butyric acids). Leachate percolating through a landfill can amass these organic acids, resulting in decreased pH of the leachate and increasing oxygen demand. Anaerobic activity also can lower the reduction oxidation (redox) status of the wastes which, under low pH conditions, can cause an increase in inorganic contaminants. Eventually, bacteria within the landfill begin converting the organic acids to methane. The removal of organic acids from the landfill increases the pH of the leachate which can lead to a decrease in the solubility of inorganic contaminants, lowering inorganic concentrations in the leachate.

A landfill's age or degree of decomposition may, in certain circumstances, be ascertained by observing the concentration of various leachate indicator parameters, such as BOD_5, TDS, or the organic nitrogen concentration. The concentrations of these leachate indicator parameters can vary over the decomposition life of a landfill. Using these indicator parameters alone does not take into account any refuse-filling variables, such as processing and fill depth. To compensate for these additional variables, ratios of leachate parameters over time were examined by researchers (see reference 13). One such ratio is the ratio of BOD_5 to COD in the leachate. Leachates from younger landfills typically exhibit BOD_5 to COD ratios of approximately 0.8, while older landfills exhibit a ratio as low as 0.1. The decline in the BOD_5 to COD ratio with age is due primarily to the readily decomposable material (phenols, alcohols) degrading faster than the more recalcitrant compounds (heavy molecular weight organic compounds). As a result, the BOD_5 of the leachate will decrease faster than the COD as the landfill ages. Other ratios examined that reportedly decrease over time include: volatile solids to fixed solids, volatile acids to TOC, and sulfate to chloride (see reference 13).

It is common to find that the sum of individual organic contaminants does not always match the measured TOC and/or COD value. As demonstrated by data collected by EPA for this guideline, the sum of the individual organic pollutants represent only a certain percentage of the TOC and/or COD value, as shown in Tables 6-7, 6-8, 6-9, and 6-11 presented later in this chapter. Compounds that comprise this difference are not always readily identified due to the complex nature of leachate and due to the presence of other organic compounds found in leachate. A myriad of organic compounds exist in decomposing refuse and most of the organics in leachate are soluble. Reportedly, free volatile acids constitute the main organic fraction in leachate (see reference 13). However, other organic compounds have been identified in landfill leachates including carbohydrates, proteins, and humic and fulvic-like substances. Gaps in mass balance results are typically attributed to these compounds.

Responses to EPA's Detailed Questionnaire indicate that 1,659 in-scope landfills collect leachate at a mean daily flow of 14,000 gallons per day. In 1992, approximately 6.9 billion gallons of landfill leachate were generated by landfills in the United States. Of this 6.9 billion gallons, approximately 1.7 billion gallons were treated on-site, 475 million gallons were treated off-site, 3.6 billion gallons were sent untreated to POTWs, 417 million gallons were sent untreated to a surface water, 350 million gallons were recycled back to the landfill, and 358 million gallons were treated or disposed by other methods.

6.3.1.1.1 <u>Additional Sources of Non-Hazardous Leachate Characterization Data</u>

Various sources of non-hazardous landfill leachate characteristics exist in published literature. Most of these are from studies taken at an isolated range of municipal landfills in the 1970s and 1980s. Data presented in these reports on leachate characteristics are typically expressed in ranges due the variability of the results. The range of values, as well as the lack of specific information on factors affecting leachate results (e.g., sampling methods, analytical methods, landfill waste types, etc.) limit the usefulness of these data. However, these data are mentioned as additional background information in support of EPA's characterization activities. Table 6-3 presents a summary of available municipal leachate characteristic data from the following sources:

- Five published papers: George, 1972; Chian and DeWalle, 1977; Metry and Cross, 1977; Cameron, 1978; and Shams-Korzani and Henson, 1993.

- McGinley, Paul M. and Kmet, P. "Formation, Characteristics, treatment and Disposal of Leachate from Municipal Solid Waste Landfills." Wisconsin Department of Natural Resources Special Report, August 1984, and

- Sobotka & Co., Inc. Case history data compiled and reported to U.S. EPA's Economic Analysis Branch, Office of Solid Waste, July 1986.

The variability and high pollutant concentrations in older landfill leachate characterization data can be attributed to landfills that accepted waste prior to the enactment of RCRA in 1980. Landfills in operation prior to this date may have disposed of a multitude of different industrial and/or toxic wastes in addition to municipal solid waste. The disposal of these high-strength wastes could account for the large variability observed in leachate characteristics data collected from municipal landfills in this period. After the promulgation of RCRA, controls were established that specified the type and characteristics of wastes that may be received by either a hazardous (Subtitle C) or non-hazardous (Subtitle D) facility (see Chapter 3: Section 3.1 for the discussion on regulatory history). Control measures, such as leachate collection systems, also have been mandated under RCRA for both types of landfills. By instituting the acceptance criteria and leachate control standards under RCRA, the characteristics of the leachate from both hazardous and non-hazardous landfills will not vary as greatly as observed in landfills prior to 1980. The smaller concentration range for pollutants from landfills in operation since RCRA became effective is supported by the data collected by EPA. Whereas pollutant variability was observed in EPA data, it was not as great as found in the literature data collected from older facilities. Data collected as part of the Landfill Rulemaking effort were within the specified ranges as found in previous literature sources, however, this data did not exhibit the large variability that is indicative of older pre-RCRA landfill operations.

6.3.1.2 Landfill Gas Condensate

Landfill gas condensate forms in the collection lines used to extract and vent/treat landfill gas. Condensate collects at low points in the system and is usually removed by pumping to the on-site wastewater holding tank or treatment system. Responses to EPA's Detailed Questionnaire indicate that 158 landfills collect landfill gas condensate at a mean daily flow of 510 gallons per day. In 1992, approximately 23 million gallons of landfill gas condensate were generated by landfills in the United States. Of this 23 million gallons, approximately 20 million gallons were treated on-site, 1.7 million gallons treated off-site, and 0.8 million gallons were sent untreated to POTWs. Of the 155 facilities collecting gas condensate, 66 commingle condensate with leachate for treatment on-site, 79 facilities do not treat the condensate on-site, and 10 facilities treat landfill gas condensate separately from other landfill generated wastewaters.

Landfill gas condensate represents a small amount of the total wastewater flow volume for the industry. Hazardous waste landfills produce 9 million gallons/year of gas condensate, or about 3 percent of the leachate flow volume. Municipal waste landfills produce 14 million gallons/year of gas condensate, or about 0.2 percent of the leachate flow volume.

Of the 37 respondents to the Detailed Questionnaire that collect landfill gas condensate, five facilities treat the condensate separately from leachate. Types of condensate treatment include equalization, neutralization, oil-water separation, GAC, and air stripping. All five facilities discharged the treated waste stream indirectly to a POTW. Table 6-4 presents landfill gas condensate monitoring data provided in the Detailed Questionnaire from two facilities that collect and treat landfill gas condensate separately from other landfill generated wastewaters. Facility 16012 presented landfill gas condensate monitoring data after treatment by hydrocarbon/aqueous phase separation and caustic neutralization, and facility 16015 presented monitoring data after treatment by equalization, caustic neutralization, and carbon adsorption.

6.3.1.3 Truck and Equipment Washwater

Truck and equipment washwater is generated during either truck or equipment washes at the landfill. Depending on the type and usage of the vehicle/equipment cleaned and the type of landfill, the washwater volume and characteristics can vary greatly. For hazardous and non-hazardous landfill facilities, washwaters will typically be more dilute in strength in comparison to typical leachate characteristics and contain mostly solids. Contaminants in the washwater are attributed to the insoluble solids, consisting of mostly inorganics, metals, and low concentrations of organic compounds. Since truck and equipment washwaters tend to contain the same constituents as the waste being landfilled, and are similar in characteristic to the landfill leachate, they are typically combined for treatment with leachate and other landfill generated wastewaters.

Responses to EPA's Detailed Questionnaire indicate that 356 in-scope landfills collect truck and equipment washwater at a mean daily flow of 864 gallons per day. In 1992, approximately 102 million gallons of truck and equipment washwater were generated by landfills in the United States. Of this 102 million gallons, approximately 38 million gallons were treated on-site, 9 million gallons were sent untreated to POTWs, 1.5 million gallons were either treated off-site, recycled back to the landfill, or sent untreated to a surface water, and 53 million gallons were treated or disposed by other methods.

6.3.1.4 Drained Free Liquids

Drained free liquids are liquids drained from containerized waste prior to landfilling. Wastewater characteristics and volume of drained free liquids vary greatly depending upon the contents and origin of the waste. However, they will have the characteristics of the containerized waste and, therefore, similar characteristics to landfill leachate. This also is true of other wastewaters generated by waste processing activities, such as waste stabilization. Waste stabilization includes the chemical fixation or solidification of the solid waste. Wastewaters generated from these activities include decant from the waste treated and any associated rinse waters. These waste processing wastewaters are collected separately and are then combined with leachate and other landfill operation wastewaters for treatment at the wastewater treatment facility.

Responses to EPA's Detailed Questionnaire indicate that 25 in-scope landfills collect drained free liquids at a mean daily flow of 5 gallons per day. In 1992, approximately 0.6 million gallons of drained free liquids were generated by landfills in the United States. Of this 0.6 million gallons, approximately 521,000 gallons were recycled back to the landfill and 47,000 gallons were treated or disposed by other methods.

6.3.2 Pollutant Parameters Analyzed at EPA Sampling Episodes

The EPA conducted 19 sampling episodes at 18 landfill facilities. Five episodes were conducted at hazardous landfill facilities and 13 at non-hazardous facilities. One-day sampling episodes were conducted for the purpose of collecting raw wastewater samples to characterize landfill generated wastewaters. Samples collected during the week-long sampling episodes included raw wastewater samples as well as intermediate and effluent samples to evaluate the entire wastewater treatment system. Chapter 4 discusses these data collection activities in further detail.

Table 6-5 presents the pollutants analyzed at the one-day and week-long sampling episodes. A total of 470 pollutants were analyzed for in the raw wastewater, intermediate, and treated effluent waste stream samples, including 232 toxic and nonconventional organic compounds, 69 toxic and nonconventional metals, 4 conventional pollutants, and 165 toxic and nonconventional pollutants including pesticides, herbicides, dioxins, and furans. The list of pollutants analyzed are included under the following analytical methods: method 1613 for dioxins/furans; method 1620 for metals; method 1624 for volatile organics; method 1625 for semivolatile organics; and methods 1656, 1657, and 1658 for pesticides/herbicides, as well as classical wet chemistry methods.

Table 6-6 presents the list of pollutants analyzed at EPA sampling episodes by subcategory and episode number and whether they were detected in the facility's raw wastewater. If a pollutant was not detected it is reported on the table as ND, if a pollutant was detected it is reported as a blank, and pollutants that were not sampled are represented by a dash.

Composite samples were collected at the week-long sampling events at episodes 4626, 4667, 4687, 4690, 4721, and 4759; grab samples were collected at the remaining 11 one-day sampling events. A preliminary list of pollutants of interest was developed by reducing the list of 470 pollutants by the number of pollutants that were never detected at any facility in a subcategory. For the Non-Hazardous subcategory, a total of 316 pollutants were analyzed for but never detected in the raw wastewater at Subtitle D municipal facilities, and 324 pollutants were never detected in the raw wastewater at Subtitle D non-municipal facilities. For the Hazardous subcategory, a total of 250 pollutants were never detected in the raw wastewater. Therefore, out of the 470 pollutants initially analyzed for, a total of 154 pollutants were detected at least once at Subtitle D municipal facilities; 146 pollutants were detected at least once at Subtitle D non-municipal facilities; and 220 pollutants were detected at least once at hazardous facilities. Using the editing criteria which is presented in detail in Chapter 7, this preliminary list of pollutants of interest was reduced to the final list of 33 pollutants of interest for the Non-Hazardous subcategory (32 pollutants of interest for Subtitle D municipal facilities and 10 pollutants of interest for Subtitle D non-municipal facilities); and 63 pollutants of interest for the Hazardous subcategory. These pollutants are presented on Tables 6-7 and 6-8 and are discussed further below.

6.3.3 Raw Wastewater Characterization Data

EPA compiled raw wastewater sampling data obtained from the following sources: EPA sampling; the Detailed Questionnaire; the Detailed Monitoring Questionnaire; the CERCLA groundwater database; and the Centralized Waste Treatment Industry (CWT) database in order to characterize wastewater from the Landfills industry.

EPA then reviewed each data source to determine if the data was representative of landfill generated wastewater. First, EPA selected only those sample points corresponding to raw wastewater by reviewing treatment flow diagrams and sampling programs at each landfill facility. Second, EPA used several criteria to eliminate sampling data not considered representative of raw landfill wastewaters. Only those data collection points which sampled wastewaters containing at least 85 percent leachate and/or gas condensate were included in the characterization study. In this way, facilities that sampled wastestreams containing mostly storm water or sanitary wastewaters were eliminated. Also, any sample point containing industrial process wastewater was eliminated. This eliminated the possibility of finding pollutants that may not have originated in a landfill.

Next, EPA grouped all data points according to the classification of the landfill, e.g. municipal solid waste, hazardous waste, or Subtitle D non-municipal solid waste. Tables 6-9 through 6-11 present the range of all values compiled for raw wastewaters, listed by landfill type.

In several instances, EPA conducted sampling at a facility that also provided data in the technical questionnaires. In these cases, EPA compiled all data at that landfill from the different sources to obtain one average concentration for each pollutant at each landfill. The median concentration of each landfill average concentration was then calculated to determine the median industry raw wastewater concentrations. These median values are presented in Tables 6-7 and 6-8 as the raw wastewater Master File.

6.3.4 Conventional, Toxic, and Selected Nonconventional Pollutant Parameters

The Clean Water Act defines different types of pollutant parameters used to characterize raw wastewater. These parameters include conventional, nonconventional, and toxic pollutants. Conventional pollutants found in landfill generated wastewaters include:

- Total Suspended Solids (TSS)
- 5-day Biochemical Oxygen Demand (BOD_5)
- pH
- Oil and Grease (measured as Hexane Extractable Material)

Total solids in wastewater is defined as the residue remaining upon evaporation of the liquid at just above its boiling point. TSS is the portion of the total solids that can be filtered out of solution using a 1 micron filter. Raw wastewater TSS in leachate is a function of the type and form of wastes accepted for disposal at landfill facilities. The concentration of TSS also is influenced by the landfill design and operational parameters such as depth of fill, compaction, and capping. BOD_5 is one of the most important gauges of pollution potential of a wastewater and varies with the amount of biodegradable matter that can be assimilated by biological organisms under aerobic conditions. The nature of the chemicals contained in landfill generated wastewaters affects the BOD_5 due to the differences in susceptibility of different molecular structures to microbiological degradation. Landfill generated wastewater containing compounds with lower susceptibility to decomposition by microorganisms tend to exhibit lower BOD_5 values, even though the total organic loading may be much higher as compared to wastewaters exhibiting substantially higher BOD_5 values. For example, a landfill generated wastewater may have a low BOD_5 value while at the same time exhibiting a high TOC or COD concentration. Raw wastewater BOD_5 values can vary depending on the waste deposited in the landfill and the landfill age, as noted previously in Section 6.3.1.1.

The pH of a solution is a unitless measurement which represents the acidity or alkalinity of a wastewater stream (or aqueous solution) based on the disassociation of the acid or base in the solution into hydrogen (H^+) or hydroxide (OH^-) ions, respectively. Raw wastewater pH can be a function of the waste deposited in a landfill but can vary depending on the conditions within the landfill, as noted previously in Section 6.3.1.1. Fluctuations in pH are controlled readily by equalization followed by neutralization. Control of pH is necessary to achieve proper removal of pollutants in treatment systems such as metals precipitation and biological treatment systems.

Oil and grease also may be present in selected landfill generated wastewaters. Proper control of oil and grease is important because it can interfere with the operation of certain wastewater treatment system processes such as chemical precipitation and the settling operations in biological systems. If it is not removed prior to discharge, excessive levels of oil and grease can interfere with the operation of POTWs and can create films along surface waters, disrupting the biological activities in those waterways.

Table 6-9 presents observed minimum and maximum concentration data for TSS, BOD_5, and oil and grease for each landfill subcategory and the observed minimum and maximum values for pH. The minimum and maximum values presented for each pollutant were obtained from the Source File for both subcategories. The Source File reports the facility average for each pollutant in a subcategory, and contains many pollutants which were detected at least once in a subcategory but were not necessarily selected as pollutants of interest.

Certain classical nonconventional pollutants often are grouped with conventional pollutants (as defined by the Clean Water Act) for the purposes of raw wastewater characterization. These pollutant parameters include: ammonia as nitrogen, nitrate/nitrite, total dissolved solids, total organic carbon, total phenols, chemical oxygen demand, amenable cyanide, and total phosphorus. All of these pollutants are pollutants of interest with the exception of total phosphorus. For the purposes of presenting raw wastewater characterization data, these nonconventional pollutants have been included with the conventional pollutants for each landfill subcategory in Table 6-9.

6.3.5 Toxic Pollutants and Remaining Nonconventional Pollutants

Table 6-10 presents the metals data for raw wastewaters from the two subcategories: Non-Hazardous and Hazardous. A wide range of metals were detected in raw wastewaters from landfill facilities in both subcategories including both toxic pollutant and nonconventional pollutant metals.

Table 6-11 presents the organic toxic and nonconventional pollutant data for the two subcategories. A wide range of organic pollutants were detected in raw wastewaters at landfill facilities in the Non-Hazardous and Hazardous subcategories. Many of these are common organic pollutants found in municipal or commercial waste.

6.3.6 Raw Wastewater at Subtitle D Non-Hazardous Landfills

6.3.6.1 Raw Wastewater at Subtitle D Non-Hazardous Landfills: Municipal

Raw wastewater generated at Subtitle D municipal landfills contained a range of conventional, toxic, and nonconventional pollutants. These wastewaters also contained significant concentrations of common nonconventional metals such as iron, magnesium, and manganese. These metals are naturally occurring elements found in raw water, and the presence of these metals in landfill raw wastewater can be attributed to background levels in the water source used at the facility. Any change between the influent and effluent concentrations of these metals are impacted by the addition of treatment chemicals that contain these metals and, therefore, were not considered as pollutants of interest. Generally, concentrations of toxic heavy metals were found at relatively low concentrations. EPA did not find toxic metals such as arsenic, cadmium, mercury, and lead at treatable levels in any of EPA's sampling episodes. Typical organic pollutants found in leachate included 2-butanone (methyl ethyl ketone) and 2-propanone (acetone) which are common solvents used in household products (such as paints and nail polish) and common industrial solvents such 4-methyl-2-pentanone and 1,4-dioxane. Trace concentrations of only a few pesticides were detected in wastewaters from municipal landfills. Additionally, the wastewater was characterized by high loads of organic acids such as benzoic acid and hexanoic acid resulting from anaerobic decomposition of solid waste.

EPA identified 32 pollutants of interest for Subtitle D municipal landfills including: eight conventional/nonconventional pollutants, six metals, 16 organics and pesticides/herbicides, and two dioxins/furans. Three hundred and sixteen pollutants were never detected in EPA sampling episodes, and approximately 122 pollutants were detected but were not considered to be above the minimum level.

6.3.6.2 Raw Wastewater at Subtitle D Non-Hazardous Landfills: Non-Municipal

A subset of the Subtitle D Non-Hazardous landfill subcategory is Subtitle D non-municipal. These types of landfills do not accept typical municipal solid waste or household refuse; rather, these facilities accept a number of different types of non-hazardous, non-municipal solid wastes. Waste incinerator ash, industrial non-hazardous wastes and sludges, wastewater treatment plant sludge, yard waste, or construction and demolition (C&D) wastes.

EPA identified 10 pollutants of interest for Subtitle D non-municipal landfills including: eight conventional/nonconventional pollutants, one metal, and one pesticide/herbicide. Three hundred twenty-four pollutants were never detected in EPA sampling episodes, and 136 pollutants were detected but were not considered to be above the minimum level.

Many non-hazardous non-municipal facilities accept two or more of the non-municipal waste types discussed above. Certain unique facilities accept only one type of waste and are referred to as "monofills". Because of the unique nature of these monofills, EPA performed an analysis to determine if significant differences existed in raw wastewater characteristics from Subtitle D municipal landfills and these monofill facilities. However, characterization and treatment data collected as part of EPA's sampling episodes focused primarily on the more prevalent Subtitle D municipal landfills. To complete this analysis, additional data on raw wastewaters from monofill facilities were collected from several sources including prior EPA studies (see Chapter 5, Section 5.3.1 for discussion of these studies) and industry supplied data. These data were evaluated to identify any pollutants found at significant concentrations in monofills which were not found in Subtitle D municipal landfills.

Based on a review of these data sources, EPA observed that the pollutants present in raw wastewaters from monofills were not significantly different from those found in Subtitle D municipal landfills, and, in fact, only a subset of Subtitle D municipal landfill pollutants of interest were found in raw wastewaters from these monofill facilities. In addition, concentrations of virtually all pollutants found in ash, sludge, and C&D waste monofills were significantly lower than those found in raw wastewaters from Subtitle D municipal landfills (see Table 5-1, Chapter 5). As discussed in Chapter 11, EPA proposes to establish equivalent effluent limitations for all Subtitle D non-hazardous landfills.

6.3.6.3 Dioxins and Furans in Raw Wastewater at Subtitle D Non-Hazardous Landfills

There are 210 isomers of chlorinated dibenzo-p-dioxins (CDD) and chlorinated dibenzofurans (CDF). EPA is primarily concerned with the 2,3,7,8-substituted congeners, of which 2,3,7,8-TCDD is considered to be the most toxic and is the only one that is a toxic pollutant. Non 2,3,7,8-substituted congeners are considered less toxic in part, because they are not readily absorbed by living organisms. Dioxins and furans may be formed as by-products in certain industrial unit operations related to petroleum refining, pesticide and herbicide production, paper bleaching, and production of materials involving chlorinated compounds. Dioxins and furans are not water-soluble and are not expected to leach out of non-hazardous landfills in significant quantities.

As part of EPA sampling episodes at 13 non-hazardous landfills, raw wastewater samples were collected, and a total of 17 congeners of dioxins and furans were analyzed. The results of the data analyses are presented in Table 6-12. Additional raw leachate data from previous EPA studies (see Chapter 5, Section 5.3.1) were analyzed from ash monofills. EPA found low levels of OCDD, HpCDD, and HxCDD in raw wastewaters at several landfills. The most toxic dioxin congener, 2,3,7,8-TCDD, was never detected in raw wastewater at a Subtitle D landfills. All concentrations of dioxins and furans in raw, untreated wastewater were well below the Universal Treatment Standards proposed for FO39 wastes (multi-source leachate) in 40 CFR 268.1, which establish minimum concentration standards based on an acceptable level of risk. At the concentrations found in raw landfill wastewaters, dioxins and furans are expected to partition to the biological sludge as part of the proposed BPT/BAT treatment technologies. Partitioning of dioxins and furans to the sludge was included in the evaluation of treatment benefits and water quality impacts. EPA sampling data and calculations conclude that the concentrations of dioxins and furans present in the wastewater would not prevent the sludge from being redeposited in a non-hazardous landfill.

6.3.7 Raw Wastewater at Subtitle C Hazardous Landfills

Raw wastewaters from Subtitle C hazardous landfills also were characterized through EPA sampling episodes and industry supplied data obtained through the Detailed Questionnaires. Wastewater generated at Subtitle C landfills contained a wide range of conventional, toxic, and nonconventional pollutants at treatable levels. There was a significant increase in the number of pollutants found in raw wastewaters at hazardous landfills compared to non-hazardous landfills. Pollutants which were common to both untreated non-hazardous and hazardous wastewaters were generally an order of magnitude higher in hazardous landfill wastewater. The list of pollutants of interest for the Hazardous subcategory (presented in Table 6-8), which includes 63 parameters, reflects the more toxic nature of hazardous landfill wastewater and the wide range of industrial waste sources.

Pollutants typical of raw leachate from hazardous facilities included higher levels of arsenic, chromium, copper, nickel, and zinc than those concentrations found at Subtitle D facilities. Cadmium, lead, and mercury were not detected at treatable concentrations in the raw wastewater for any of the hazardous landfills sampled during EPA sampling episodes.

EPA identified a total of 63 pollutants of interest for Subtitle C hazardous landfills including: 11 conventional/nonconventional pollutants, 11 metals, 37 organics and pesticides/herbicides, and four dioxins/furans. Two hundred fifty pollutants were never detected in EPA sampling episodes, and approximately 157 pollutants were detected but were not considered to be present at above the minimum level.

6.3.7.1 Dioxins and Furans in Raw Wastewater at Subtitle C Hazardous Landfills

As part of EPA sampling episodes at two in-scope Subtitle C landfills and two in-scope pre-1980 industrial landfills, raw leachate samples were collected, and a total of 17 congeners of dioxins and furans were analyzed. The results of these analyses are presented in Table 6-13. Again, EPA did not detect the most toxic dioxin congener, 2,3,7,8-TCDD, at an in-scope hazardous/industrial landfill. EPA found low levels of several congeners in raw wastewaters at many of the sampled landfills. Low levels of OCDD, OCDF, HpCDD, and HpCDF were detected in over half of the landfills sampled. However, all concentrations of dioxins and furans in raw, untreated wastewater were well below the Universal Treatment Standards proposed for F039 wastes (multi-source leachate) in 40 CFR 268.1, which establish minimum concentration standards based on an acceptable level of risk. At the concentrations found in raw landfill wastewaters, dioxins and furans are expected to partition to the biological sludge as part of the proposed BPT/BAT/PSES treatment technologies. Partitioning of dioxins and furans to the sludge was included in the evaluation of treatment benefits and water quality impacts.

Table 6-1: Wastewater Generation in 1992: Hazardous Subcategory (gallons)

Discharge Type	Wastewater Type	Treated On-Site	Treated Off-Site	Untreated to POTW	Untreated to Surface Water	Recycled Flow	Other
Indirect	Leachate	37,600,000	0	0	0	0	0
	Gas Condensate	772,000	0	0	0	0	0
	Truck/Equipment Washwater	1,220,000	0	101,000	0	0	0
	Floor Washings	706,000	0	0	0	0	0
	Storm water	0	0	4,740,000	294,000,000	0	0
	Total Indirect	40,298,000	0	4,841,000	294,000,000	0	0
Zero	Leachate	42,300,000	20,800,000	0	0	0	169,000,000
	Gas Condensate	8,390,000	0	0	0	0	0
	Drained Free Liquids	0	0	0	0	0	47,000
	Truck/Equipment Washwater	36,300	513,000	0	0	0	50,300,000
	Floor Washings	0	0	0	0	0	35,000,000
	Contaminated Groundwater	28,700,000	0	0	0	0	0
	Storm water	211,000,000	2,300,000	30,700,000	662,000,000	0	0
	Total Zero	290,426,300	23,613,000	30,700,000	662,000,000	0	254,347,000
Subcategory Total		330,724,300	23,613,000	35,541,000	956,000,000	0	254,347,000

Table 6-1: Wastewater Generation in 1992: Non-Hazardous Subcategory Subtitle D Municipal Facilities (gallons)

Discharge Type	Wastewater Type	Treated On-Site	Treated Off-Site	Untreated to POTW	Untreated to Surface Water	Recycled Flow	Other
Direct	Leachate	565,000,000	782,000	55,400,000	167,000,000	49,000	94,400,000
	Gas Condensate	1,570,000	0	501,000	0	0	0
	Drained Free Liquids	715	0	0	0	0	0
	Truck/Equipment Washwater	15,300,000	0	54,900	0	0	0
	Floor Washings	4,890,000	0	0	0	0	0
	Contaminated Groundwater	163,000,000	0	0	0	0	0
	Storm water	1,830,000,000	0	0	3,430,000,000	0	0
	Total Direct	2,579,760,715	782,000	55,955,900	3,597,000,000	49,000	94,400,000
Indirect	Leachate	756,000,000	2,330,000	3,460,000,000	0	29,800,000	5,870,000
	Gas Condensate	9,700,000	65,900	292,000	0	0	19,700
	Truck/Equipment Washwater	20,700,000	0	9,000,000	594,000	0	0
	Floor Washings	794,000	0	3,320,000	0	0	0
	Contaminated Groundwater	226,000,000	0	259,000,000	0	0	0
	Storm water	2,230,000,000	0	677,000,000	3,890,000,000	85,400,000	1,060,000,000

Table 6-1: Wastewater Generation in 1992: Non-Hazardous Subcategory Subtitle D Municipal Facilities (gallons)

Discharge Type	Wastewater Type	Treated On-Site	Treated Off-Site	Untreated to POTW	Untreated to Surface Water	Recycled Flow	Other
Indirect (cont.)	Other	0	0	3,910,000	0	0	0
	Total Indirect	3,243,194,000	2,395,900	4,412,522,000	3,890,594,000	115,200,000	1,065,889,700
Zero	Leachate	170,000,000	449,000,000	0	0	233,000,000	88,600,000
	Gas Condensate	0	1,610,000	0	0	0	0
	Truck/Equipment Washwater	425,000	0	0	0	177,000	2,990,000
	Contaminated Groundwater	296,000,000	0	0	0	0	0
	Storm water	3,930,000	0	0	137,000,000	212,000,000	24,700,000
	Total Zero	470,355,000	450,610,000	0	137,000,000	445,177,000	116,290,000
Subcategory Total		6,293,309,715	453,005,900	4,468,477,900	7,624,594,000	560,426,000	1,276,579,700

Table 6-1: Wastewater Generation in 1992: Non-Hazardous Subcategory Subtitle D Non-Municipal Facilities (gallons)

Discharge Type	Wastewater Type	Treated On-Site	Treated Off-Site	Untreated to POTW	Untreated to Surface Water	Recycled Flow	Other
Direct	Leachate	37,600,000	0	9,800	250,000,000	0	0
	Storm water	117,000,000	0	0	28,400,000	0	0
	Total Direct	154,600,000	0	9,800	278,400,000	0	0
Indirect	Leachate	43,000,000	0	120,000,000	0	85,100,000	0
	Contaminated Groundwater	0	0	4,120,000	0	0	0
	Storm water	19,800,000	0	0	0	0	43,100,000
	Total Indirect	62,800,000	0	124,120,000	0	85,100,000	43,100,000
Zero	Leachate	0	2,570,000	0	0	1,290,000	0
	Drained Free Liquids	0	0	0	0	521,000	0
	Truck/Equipment Washwater	0	0	0	0	209,000	0
	Storm water	0	0	0	0	17,100,000	0
	Total Zero	0	2,570,000	0	0	19,120,000	0
Subcategory Total		217,400,000	2,570,000	124,129,800	278,400,000	104,220,000	43,100,000

Table 6-2: Quantity of In-Scope Wastewater Generated in 1992 (gal)

Discharge Status	Subcategory					Total Wastewater Generated	Total Number of Facilities
	Non-Hazardous			Hazardous			
	Subtitle D Municipal	Subtitle D Non-Municipal	Subtitle D Facilities	Subtitle C	Subtitle C Facilities		
Direct	904,947,615	287,609,800	158	0	0	1,192,557,415	158
Indirect	4,298,485,600	248,100,000	762	40,399,000	6	4,586,984,600	768
Zero	945,802,000	4,590,000	343	326,386,300	141	1,276,778,300	484
Total	6,149,235,215	540,299,800	1,263	366,785,300	147	7,056,320,315	1,410

Table 6-3: Contaminant Concentration Ranges in Municipal Leachate as Reported in Literature Sources

Pollutant Parameter	George (1972)	Chain/DeWalle (1977)	Metry/Cross (1977)	Cameron (1978)	Wisconsin Report (20 Sites)	Sobotka Report (44 Sites)
Conventional						
BOD	9 - 54,610	81 - 33,360	2,200 - 720,000	9 - 55,000	ND - 195,000	7 - 21,600
pH	3.7 - 8.5	3.7 - 8.5	3.7 - 8.5	3.7 - 8.5	5 - 8.9	5.4 - 8.0
TSS	6 - 2,685	10 - 700	13 - 26,500		2 - 140,900	28 - 2,835
Non-Conventional						
Alkalinity	0 - 20,850	0 - 20,850	310 - 9,500	0 - 20,900	ND - 15,050	0 - 7,375
Bicarbonate			3,260 - 5,730			
Chlorides	34 - 2,800	4.7 - 2,467	47 - 2,350	34 - 2,800	2 - 11,375	120 - 5,475
COD	0 - 89,520	40 - 89,520	800 - 750,000	0 - 9,000	6.6 - 97,900	440 - 50,450
Fluorides				0 - 2.13	0 - 0.74	0.12 - 0.790
Hardness	0 - 22,800	0 - 22,800	35 - 8,700	0 - 22,800	52 - 225,000	0.8 - 9,380
NH3-Nitrogen	0 - 1,106	0 - 1,106	0.2 - 845	0 - 1,106		11.3 - 1,200
NO3-Nitrogen	0 - 1,300	0.2 - 1,0.29	4.5 - 18			0 - 5,0.95
Organic Nitrogen			2.4 - 550			4.5 - 78.2
Ortho-Phosphorus		6.5 - 85	0.3 - 136	0 - 154		
Sulfates	1 - 1,826	1 - 1,558	20 - 1,370	0 - 1,826	ND - 1,850	8 - 500
Sulfide				0 - 0.13		
TOC		256 - 28,000			ND - 30,500	5 - 6,884
TDS	0 - 42,276	584 - 44,900	100 - 51,000	0 - 42,300	584 - 50,430	1,400 - 16,120
Total-K-Nitrogen	0 - 1,416				2 - 3,320	47.3 - 938
Total Phosphorus	1 - 154	0 - 130			ND - 234	
Total Solids		0 - 59,200				1,900 - 25,873
Metals						
Aluminum				0 - 122	ND - 85	0.010 - 5.07
Arsenic				0 - 11.6	ND - 70.2	0 - 0.08
Barium				0 - 5.4	ND - 12.5	0.01 - 10
Beryllium				0 - 0.3	ND - 0.36	0.001 - 0.01
Boron				0.3 - 73	0.867 - 13	
Cadmium		0.03 - 17		0 - 0.19	ND - 0.04	0 - 0.1
Calcium	5 - 4,080	60 - 7,200	240 - 2,570	5 - 4,000	200 - 2,500	95.5 - 2,100
Total Chromium				0 - 33.4	ND - 5.6	0.001 - 1.0
Copper	0 - 9.9	0 - 9.9		0 - 10	ND - 4.06	0.003 - 0.32
Cyanide				0 - 0.11	ND - 6	0 - 4.0
Iron	0.2 - 5,500	0 - 2,820	0.12 - 1,700	0.2 - 5,500	ND - 1,500	0.22 - 1,400
Lead	0 - 0.5	<0.10 - 2.0		0 - 5.0	0 - 14.2	0.001 - 1.11
Magnesium	16.5 - 15,600	17 - 15,600	64 - 547	16.5 - 15,600	ND - 780	76 - 927
Manganese	0.06 - 1,400	0.09 - 125	13	0.06 - 1,400	ND - 31.1	0.03 - 43
Mercury				0 - 0.064	ND - 0.01	0 - 0.02
Molybendum				0 - 0.52	0.01 - 1.43	
Nickel				0.01 - 0.8	ND - 7.5	0.01 - 1.25
Potassium	2.8 - 3,770	28 - 3,770	28 - 3,800	2.8 - 3,770	ND - 2,800	30 - 1,375
Sodium	0 - 7,700	0 - 7,700	85 - 3,800	0 - 7,700	12 - 6,010	
Titanium				0 - 5.0	<0.01	
Vanadium				0 - 1.4	0.01	
Zinc	0 - 1,000	0 - 370	0.03 - 135	0 - 1,000	ND - 731	0.01 - 67

All concentrations in mg/l, except pH (std units).
ND = Non-detect

Table 6-4: Landfill Gas Condensate (from Detailed Questionnaire)

QID	Pollutant	# Obs	# ND	Avg. Conc.	Unit
16012	**Conventional**				
	Oil & Grease	1	0	422	mg/l
	Metals				
	Arsenic	1	0	570	ug/l
16015	**Organics**				
	1,2-Benzenedicarboxylic Acid, Diethyl Ester	3	1	2.0	mg/l
	1,3-Butadiene, 1,1,2,3,4,4-Hexachloro-	3	1	2.2	mg/l
	1,3-Dichlorobenzene	3	1	1.2	mg/l
	1,4-Dichlorobenzene	3	1	2.0	mg/l
	2,4,6-Trichlorophenol	3	2	15.0	mg/l
	2,4-Dichlorophenol	3	2	15.0	mg/l
	2,4-Dimethylphenol	3	2	17.3	mg/l
	2,6-Dinitrotoluene	3	2	5.83	mg/l
	2-Methyl-4,6-Dinitrophenol	3	0	100	mg/l
	2-Nitrophenol	3	2	17.5	mg/l
	3,4-Benzopyrene	3	2	2.0	mg/l
	3-Methyl-4-Chlorophenol	3	1	20.0	mg/l
	Benz(E)Acephenenthrylene	3	2	2.33	mg/l
	Benzenamine, 4-Nitro-	3	1	2.2	mg/l
	Benzene, Nitro-	3	2	4.3	mg/l
	Benzene Hexachloride	3	1	2.3	mg/l
	Benzene, Ethyl-	3	2	3.4	mg/l
	Benzene, Methyl-	3	2	2.6	mg/l
	Benzo(Def)Phenanthrene	3	1	2.2	mg/l
	Bis(2-Chloroethoxy)Methane	3	2	2.8	mg/l
	Chloroform	3	2	3.9	mg/l
	Di-n-propyl Nitrosamine	3	0	3.3	mg/l
	Ethene, Trichloro	3	2	2.5	mg/l
	Ethene, Tetrachloro-	3	1	10.6	mg/l
	O-Chlorophenol	3	2	8.7	mg/l
	Residue, Non-flammable	3	0	27.2	mg/l
	Metals				
	Gold	3	1	0.04	mg/l
	Lead	3	2	0.13	mg/l
	Zinc	3	0	0.14	mg/l

16012: Treated effluent after hydrocarbon/aqueous phase separation and caustic neutralization.
16015: Treated effluent after equalization, caustic neutralization, and carbon adsorption.
QID: Questionnaire ID number
Obs: Number of observations
ND: Number of non-detects

Table 6-5 Epa Sampling Episode Pollutants Analyzed

POLLUTANT	CAS NUM	POLLUTANT	CAS NUM
CLASSSICAL WET CHEMISTRY		**1657: PESTICIDES/HERBICIDES**	
AMENABLE CYANIDE	C-025	MONOCROTOPHOS	6923-22-4
AMMONIA NITROGEN	7664-41-7	NALED	300-76-5
BOD	C-002	PARATHION (ETHYL)	56-38-2
CHLORIDE	16887-00-6	PHORATE	298-02-2
COD	C-004	PHOSMET	732-11-6
FLUORIDE	16984-48-8	PHOSPHAMIDON E	297-99-4
HEXANE EXTRACTABLE MATERIAL	C-036	PHOSPHAMIDON Z	23783-98-4
HEXAVALENT CHROMIUM	18540-29-9	RONNEL	299-84-3
NITRATE/NITRITE	C-005	SULFOTEPP	3689-24-5
PH	C-006	SULPROFOS	35400-43-2
RECOVERABLE OIL AND GREASE	C-007	TEPP	107-49-3
TDS	C-010	TERBUFOS	13071-79-9
TOC	C-012	TETRACHLORVINPHOS	22248-79-9
TOTAL CYANIDE	57-12-5	TOKUTHION	34643-46-4
TOTAL PHENOLS	C-020	TRICHLORFON	52-68-6
TOTAL PHOSPHORUS	14265-44-2	TRICHLORONATE	327-98-0
TOTAL SOLIDS	C-008	TRICRESYLPHOSPHATE	78-30-8
TOTAL SULFIDE	18496-25-8	TRIMETHYLPHOSPHATE	512-56-1
TSS	C-009	**1656: PESTICIDES/HERBICIDES**	
1613: DIOXINS/FURANS		ACEPHATE	30560-19-1
2378-TCDD	1746-01-6	ACIFLUORFEN	50594-66-6
2378-TCDF	51207-31-9	ALACHLOR	15972-60-8
12378-PECDD	40321-76-4	ALDRIN	309-00-2
12378-PECDF	57117-41-6	ATRAZINE	1912-24-9
23478-PECDF	57117-31-4	BENFLURALIN	1861-40-1
123478-HXCDD	39227-28-6	ALPHA-BHC	319-84-6
123678-HXCDD	57653-85-7	BETA-BHC	319-85-7
123789-HXCDD	19408-74-3	GAMMA-BHC	58-89-9
123478-HXCDF	70648-26-9	DELTA-BHC	319-86-8
123678-HXCDF	57117-44-9	BROMACIL	314-40-9
123789-HXCDF	72918-21-9	BROMOXYNIL OCTANOATE	1689-99-2
234678-HXCDF	60851-34-5	BUTACHLOR	23184-66-9
1234678-HPCDD	35822-46-9	CAPTAFOL	2425-06-1
1234678-HPCDF	67562-39-4	CAPTAN	133-06-2
1234789-HPCDF	55673-89-7	CARBOPHENOTHION	786-19-6
OCDD	3268-87-9	ALPHA-CHLORDANE	5103-71-9
OCDF	39001-02-0	GAMMA-CHLORDANE	5103-74-2
1657: PESTICIDES/HERBICIDES		CHLOROBENZILATE	510-15-6
AZINPHOS ETHYL	2642-71-9	CHLORONEB	2675-77-6
AZINPHOS METHYL	86-50-0	CHLOROPROPYLATE	5836-10-2
CHLORFEVINPHOS	470-90-6	CHLOROTHALONIL	1897-45-6
CHLORPYRIFOS	2921-88-2	DIBROMOCHLOROPROPANE	96-12-8
COUMAPHOS	56-72-4	DACTHAL (DCPA)	1861-32-1
CROTOXYPHOS	7700-17-6	4,4'-DDD	72-54-8
DEF	78-48-8	4,4'-DDE	72-55-9
DEMETON A	8065-48-3A	4,4'-DDT	50-29-3
DEMETON B	8065-48-3B	DIALLATE A	2303-16-4A
DIAZINON	333-41-5	DIALLATE B	2303-16-4B
DICHLORFENTHION	97-17-6	DICHLONE	117-80-6
DICHLORVOS	62-73-7	DICOFOL	115-32-2
DICROTOPHOS	141-66-2	DIELDRIN	60-57-1
DIMETHOATE	60-51-5	ENDOSULFAN I	959-98-8
DIOXATHION	78-34-2	ENDOSULFAN II	33213-65-9
DISULFOTON	298-04-4	ENDOSULFAN SULFATE	1031-07-8
EPN	2104-64-5	ENDRIN	72-20-8
ETHION	563-12-2	ENDRIN ALDEHYDE	7421-93-4
ETHOPROP	13194-48-8	ENDRIN KETONE	53494-70-5
FAMPHUR	52-85-7	ETHALFLURALIN	55283-68-6
FENSULFOTHION	115-90-2	ETRADIAZOLE	2593-15-9
FENTHION	55-38-9	FENARIMOL	60168-88-9
HEXAMETHYLPHOSPHORAMIDE	680-31-9	HEPTACHLOR	76-44-8
LEPTOPHOS	21609-90-5	HEPTACHLOR EPOXIDE	1024-57-3
MALATHION	121-75-5	ISODRIN	465-73-6
MERPHOS	150-50-5	ISOPROPALIN	33820-53-0

Table 6-5 Epa Sampling Episode Pollutants Analyzed (Continued)			
POLLUTANT	**CAS NUM**	**POLLUTANT**	**CAS NUM**
1656: PESTICIDES/HERBICIDES		**1620: METALS**	
KEPONE	143-50-0	IODINE	7553-56-2
METHOXYCHLOR	72-43-5	IRIDIUM	7439-88-5
METRIBUZIN	21087-64-9	IRON	7439-89-6
MIREX	2385-85-5	LANTHANUM	7439-91-0
NITROFEN	1836-75-5	LEAD	7439-92-1
NORFLUORAZON	27314-13-2	LITHIUM	7439-93-2
PCB-1016	12674-11-2	LUTETIUM	7439-94-3
PCB-1221	11104-28-2	MAGNESIUM	7439-95-4
PCB-1232	11141-16-5	MANGANESE	7439-96-5
PCB-1242	53469-21-9	MERCURY	7439-97-6
PCB-1248	12672-29-6	MOLYBDENUM	7439-98-7
PCB-1254	11097-69-1	NEODYMIUM	7440-00-8
PCB-1260	11096-82-5	NICKEL	7440-02-0
PENTACHLORONITROBENZENE	82-68-8	NIOBIUM	7440-03-1
PENDAMETHALIN	40487-42-1	OSMIUM	7440-04-2
CIS-PERMETHRIN	61949-76-6	PALLADIUM	7440-05-3
TRANS-PERMETHRIN	61949-77-7	PHOSPHORUS	7723-14-0
PERTHANE	72-56-0	PLATINUM	7440-06-4
PROPACHLOR	1918-16-7	POTASSIUM	7440-09-7
PROPANIL	709-98-8	PRASEODYMIUM	7440-10-0
PROPAZINE	139-40-2	RHENIUM	7440-15-5
SIMAZINE	122-34-9	RHODIUM	7440-16-6
STROBANE	8001-50-1	RUTHENIUM	7440-18-8
TERBACIL	5902-51-2	SAMARIUM	7440-19-9
TERBUTHYLAZINE	5915-41-3	SCANDIUM	7440-20-2
TOXAPHENE	8001-35-2	SELENIUM	7782-49-2
TRIADIMEFON	43121-43-3	SILICON	7440-21-3
TRIFLURALIN	1582-09-8	SILVER	7440-22-4
1658: PESTICIDES/HERBICIDES		SODIUM	7440-23-5
DALAPON	75-99-0	STRONTIUM	7440-24-6
DICAMBA	1918-00-9	SULFUR	7704-34-9
DICHLOROPROP	120-36-5	TANTALUM	7440-25-7
DINOSEB	88-85-7	TELLURIUM	13494-80-9
MCPA	94-74-6	TERBIUM	7440-27-9
MCPP	7085-19-0	THALLIUM	7440-28-0
PICLORAM	1918-02-1	THORIUM	7440-29-1
2,4-D	94-75-7	THULIUM	7440-30-4
2,4-DB	94-82-6	TIN	7440-31-5
2,4,5-T	93-76-5	TITANIUM	7440-32-6
2,4,5-TP	93-72-1	TUNGSTEN	7440-33-7
1620: METALS		URANIUM	7440-61-1
ALUMINUM	7429-90-5	VANADIUM	7440-62-2
ANTIMONY	7440-36-0	YTTERBIUM	7440-64-4
ARSENIC	7440-38-2	YTTRIUM	7440-65-5
BARIUM	7440-39-3	ZINC	7440-66-6
BERYLLIUM	7440-41-7	ZIRCONIUM	7440-67-7
BISMUTH	7440-69-9		
BORON	7440-42-8		
CADMIUM	7440-43-9		
CALCIUM	7440-70-2		
CERIUM	7440-45-1		
CHROMIUM	7440-47-3		
COBALT	7440-48-4		
COPPER	7440-50-8		
DYSPROSIUM	7429-91-6		
ERBIUM	7440-52-0		
EUROPIUM	7440-53-1		
GADOLINIUM	7440-54-2		
GALLIUM	7440-55-3		
GERMANIUM	7440-56-4		
GOLD	7440-57-5		
HAFNIUM	7440-58-6		
HOLMIUM	7440-60-0		
INDIUM	7440-74-6		

Table 6-5 Epa Sampling Episode Pollutants Analyzed (Continued)

POLLUTANT	CAS NUM	POLLUTANT	CAS NUM
1624: VOLATILE ORGANICS		**1625: SEMIVOLATILE ORGANICS**	
1,1-DICHLOROETHANE	75-34-3	1-METHYLFLUORENE	1730-37-6
1,1-DICHLOROETHENE	75-35-4	1-METHYLPHENANTHRENE	832-69-9
1,1,1-TRICHLOROETHANE	71-55-6	1-PHENYLNAPHTHALENE	605-02-7
1,1,1,2-TETRACHLOROETHANE	630-20-6	1,2-DIBROMO-3-CHLOROPROPANE	96-12-8
1,1,2-TRICHLOROETHANE	79-00-5	1,2-DICHLOROBENZENE	95-50-1
1,1,2,2-TETRACHLOROETHANE	79-34-5	1,2-DIPHENYLHYDRAZINE	122-66-7
1,2-DIBROMOETHANE	106-93-4	1,2,3-TRICHLOROBENZENE	87-61-6
1,2-DICHLOROETHANE	107-06-2	1,2,3-TRIMETHOXYBENZENE	634-36-6
1,2-DICHLOROPROPANE	78-87-5	1,2,4-TRICHLOROBENZENE	120-82-1
1,2,3-TRICHLOROPROPANE	96-18-4	1,2,4,5-TETRACHLOROBENZENE	95-94-3
1,3-DICHLOROPROPANE	142-28-9	1,2:3,4-DIEPOXYBUTANE	1464-53-5
1,4-DIOXANE	123-91-1	1,3-BENZENEDIOL (RESORCINOL)	108-46-3
2-BUTANONE (MEK)	78-93-3	1,3-DICHLORO-2-PROPANOL	96-23-1
2-CHLORO-1,3-BUTADIENE	126-99-8	1,3-DICHLOROBENZENE	541-73-1
2-CHLOROETHYLVINYL ETHER	110-75-8	1,3,5-TRITHIANE	291-21-4
2-HEXANONE	591-78-6	1,4-DICHLOROBENZENE	106-46-7
2-METHYL-2-PROPENENITRILE	126-98-7	1,4-DINITROBENZENE	100-25-4
2-PROPANONE (ACETONE)	67-64-1	1,4-NAPHTHOQUINONE	130-15-4
2-PROPENAL (ACROLEIN)	107-02-8	1,5-NAPHTHALENEDIAMINE	2243-62-1
2-PROPEN-1-OL (ALLYL ALCOHOL)	107-18-6	2-BROMOCHLOROBENZENE	694-80-4
3-CHLOROPROPENE	107-05-1	2-CHLORONAPHTHALENE	91-58-7
4-METHYL-2-PENTANONE	108-10-1	2-CHLOROPHENOL	95-57-8
ACRYLONITRILE	107-13-1	2-ISOPROPYLNAPHTHALENE	2027-17-0
BENZENE	71-43-2	2-METHYL-4,6-DINITROPHENOL	534-52-1
BROMODICHLOROMETHANE	75-27-4	2-METHYLBENZOTHIOAZOLE	120-75-2
BROMOFORM	75-25-2	2-METHYLNAPHTHALENE	91-57-6
BROMOMETHANE	74-83-9	2-NITROANILINE	88-74-4
CARBON DISULFIDE	75-15-0	2-NITROPHENOL	88-75-5
CHLOROACETONITRILE	107-14-2	2-PHENYLNAPHTHALENE	612-94-2
CHLOROBENZENE	108-90-7	2-PICOLINE	109-06-8
CHLOROETHANE	75-00-3	2-(METHYLTHIO)BENZOTHIAZOLE	615-22-5
CHLOROFORM	67-66-3	2,3-BENZOFLUORENE	243-17-4
CHLOROMETHANE	74-87-3	2,3-DICHLOROANILINE	608-27-5
CIS-1,3-DICHLOROPROPENE	10061-01-5	2,3-DICHLORONITROBENZENE	3209-22-1
CROTONALDEHYDE	4170-30-3	2,3,4,6-TETRACHLOROPHENOL	58-90-2
DIBROMOCHLOROMETHANE	124-48-1	2,3,6-TRICHLOROPHENOL	933-75-5
DIBROMOMETHANE	74-95-3	2,4-DIAMINOTOLUENE	95-80-7
DIETHYL ETHER	60-29-7	2,4-DICHLOROPHENOL	120-83-2
ETHYL BENZENE	100-41-4	2,4-DIMETHYLPHENOL	105-67-9
ETHYL CYANIDE	107-12-0	2,4-DINITROPHENOL	51-28-5
ETHYL METHACRYLATE	97-63-2	2,4-DINITROTOLUENE	121-14-2
IODOMETHANE	74-88-4	2,4,5-TRICHLOROPHENOL	95-95-4
ISOBUTYL ALCOHOL	78-83-1	2,4,5-TRIMETHYLANILINE	137-17-7
METHYLENE CHLORIDE	75-09-2	2,4,6-TRICHLOROPHENOL	88-06-2
M-XYLENE	108-38-3	2,6-DICHLORO-4-NITROANILINE	99-30-9
O+P XYLENE	136777-61-2	2,6-DICHLOROPHENOL	87-65-0
TETRACHLOROETHENE	127-18-4	2,6-DINITROTOLUENE	606-20-2
TETRACHLOROMETHANE	56-23-5	2,6-DI-TERT-BUTYL-P-BENZOQUINONE	719-22-2
TOLUENE	108-88-3	3-BROMOCHLOROBENZENE	108-37-2
TRANS-1,2-DICHLOROETHENE	156-60-5	3-CHLORONITROBENZENE	121-73-3
TRANS-1,3-DICHLOROPROPENE	10061-02-6	3-METHYLCHOLANTHRENE	56-49-5
TRANS-1,4-DICHLORO-2-BUTENE	110-57-6	3-NITROANILINE	99-09-2
TRICHLOROETHENE	79-01-6	3,3-DICHLOROBENZIDINE	91-94-1
TRICHLOROFLUOROMETHANE	75-69-4	3,3'-DIMETHOXYBENZIDINE	119-90-4
VINYL ACETATE	108-05-4	3,5-DIBROMO-4-HYDROXYBENZONITRILE	1689-84-5
VINYL CHLORIDE	75-01-4	3,6-DIMETHYLPHENANTHRENE	1576-67-6
		4-AMINOBIPHENYL	92-67-1
		4-BROMOPHENYL PHENYL ETHER	101-55-3
		4-CHLORO-2-NITROANILINE	89-63-4
		4-CHLORO-3-METHYLPHENOL	59-50-7
		4-CHLOROANILINE	106-47-8
		4-CHLOROPHENYL PHENYL ETHER	7005-72-3
		4-NITROANILINE	100-01-6
		4-NITROBIPHENYL	92-93-3

Table 6-5 Epa Sampling Episode Pollutants Analyzed(Continued)

POLLUTANT	CAS NUM	POLLUTANT	CAS NUM
1625: SEMIVOLATILE ORGANICS		**1625: SEMIVOLATILE ORGANICS**	
4-NITROPHENOL	100-02-7	N-C12 (N-DODECANE)	112-40-3
4,4-METHYLENE-BIS(2-CHLOROANILINE)	101-14-4	N-C14 (N-TETRADECANE)	629-59-4
4,5-METHYLENE-PHENANTHRENE	203-64-5	N-C16 (N-HEXADECANE)	544-76-3
5-CHLORO-O-TOLUIDINE	95-79-4	N-C18 (N-OCTADECANE)	593-45-3
5-NITRO-O-TOLUIDINE	99-55-8	N-C20 (N-EICOSANE)	112-95-8
7,12-DIMETHYLBENZ(A)ANTHRACENE	57-97-6	N-C22 (N-DOCOSANE)	629-97-0
ACENAPHTHENE	83-32-9	N-C24 (N-TETRACOSANE)	646-31-1
ACENAPHTHYLENE	208-96-8	N-C26 (N-HEXACOSANE)	630-01-3
ACETOPHENONE	98-86-2	N-C28 (N-OCTACOSANE)	630-02-4
ALPHA-NAPHTHYLAMINE	134-32-7	N-C30 (N-TRIACONTANE)	638-68-6
ALPHA-TERPINEOL	98-55-5	NITROBENZENE	98-95-3
ANILINE	62-53-3	N-NITROSODIETHYLAMINE	55-18-5
ANTHRACENE	120-12-7	N-NITROSODIMETHYLAMINE	62-75-9
ARAMITE	140-57-8	N-NITROSODI-N-BUTYLAMINE	924-16-3
BENZANTHRONE	82-05-3	N-NITROSODI-N-PROPYLAMINE	621-64-7
BENZENETHIOL	108-98-5	N-NITROSODIPHENYLAMINE	86-30-6
BENZIDINE	92-87-5	N-NITROSOMETHYL -ETHYLAMINE	10595-95-6
BENZOIC ACID	65-85-0	N-NITROSOMETHYL-PHENYLAMINE	614-00-6
BENZO(A)ANTHRACENE	56-55-3	N-NITROSOMORPHOLINE	59-89-2
BENZO(A)PYRENE	50-32-8	N-C10 (N-DECANE)	124-18-5
BENZO(B)FLUORANTHENE	205-99-2	N-C12 (N-DODECANE)	112-40-3
BENZO(GHI)PERYLENE	191-24-2	N-C14 (N-TETRADECANE)	629-59-4
BENZO(K)FLUORANTHENE	207-08-9	N-C16 (N-HEXADECANE)	544-76-3
BENZYL ALCOHOL	100-51-6	N-C18 (N-OCTADECANE)	593-45-3
BETA-NAPHTHYLAMINE	91-59-8	N-C20 (N-EICOSANE)	112-95-8
BIPHENYL	92-52-4	N-C22 (N-DOCOSANE)	629-97-0
BIS(2-CHLOROETHOXY) METHANE	111-91-1	N-C24 (N-TETRACOSANE)	646-31-1
BIS(2-CHLOROETHYL) ETHER	111-44-4	N-C26 (N-HEXACOSANE)	630-01-3
BIS(2-CHLOROISOPROPYL) ETHER	108-60-1	N-C28 (N-OCTACOSANE)	630-02-4
BIS(2-ETHYLHEXYL) PHTHALATE	117-81-7	N-C30 (N-TRIACONTANE)	638-68-6
BUTYL BENZYL PHTHALATE	85-68-7	NITROBENZENE	98-95-3
CARBAZOLE	86-74-8	N-NITROSODIETHYLAMINE	55-18-5
CHRYSENE	218-01-9	N-NITROSODIMETHYLAMINE	62-75-9
CROTOXYPHOS	7700-17-6	N-NITROSODI-N-BUTYLAMINE	924-16-3
DIBENZOFURAN	132-64-9	N-NITROSODI-N-PROPYLAMINE	621-64-7
DIBENZOTHIOPHENE	132-65-0	N-NITROSODIPHENYLAMINE	86-30-6
DIBENZO(A,H)ANTHRACENE	53-70-3	N-NITROSOMETHYL -ETHYLAMINE	10595-95-6
DIETHYL PHTHALATE	84-66-2	N-NITROSOMETHYL-PHENYLAMINE	614-00-6
DIMETHYL PHTHALATE	131-11-3	N-NITROSOMORPHOLINE	59-89-2
DIMETHYL SULFONE	67-71-0	N-NITROSOPIPERIDINE	100-75-4
DI-N-BUTYL PHTHALATE	84-74-2	N,N-DIMETHYLFORMAMIDE	68-12-2
DI-N-OCTYL PHTHALATE	117-84-0	O-ANISIDINE	90-04-0
DIPHENYL ETHER	101-84-8	O-CRESOL	95-48-7
DIPHENYLAMINE	122-39-4	O-TOLUIDINE	95-53-4
DIPHENYLDISULFIDE	882-33-7	P-CRESOL	106-44-5
ETHYL METHANESULFONATE	62-50-0	P-CYMENE	99-87-6
ETHYLENETHIOUREA	96-45-7	P-DIMETHYLAMINO-AZOBENZENE	60-11-7
ETHYNYLESTRADIOL-3-METHYL ETHER	72-33-3	PENTACHLOROBENZENE	608-93-5
FLUORANTHENE	206-44-0	PENTACHLOROETHANE	76-01-7
FLUORENE	86-73-7	PENTACHLOROPHENOL	87-86-5
HEXACHLOROBENZENE	118-74-1	PENTAMETHYLBENZENE	700-12-9
HEXACHLOROBUTADIENE	87-68-3	PERYLENE	198-55-0
HEXACHLOROCYCLOPENTADIENE	77-47-4	PHENACETIN	62-44-2
HEXACHLOROETHANE	67-72-1	PHENANTHRENE	85-01-8
HEXACHLOROPROPENE	1888-71-7	PHENOL	108-95-2
HEXANOIC ACID	142-62-1	PHENOTHIAZINE	92-84-2
INDENO(1,2,3-CD)PYRENE	193-39-5	PRONAMIDE	23950-58-5
ISOPHORONE	78-59-1	PYRENE	129-00-0
ISOSAFROLE	120-58-1	PYRIDINE	110-86-1
LONGIFOLENE	475-20-7	SAFROLE	94-59-7
MALACHITE GREEN	569-64-2	SQUALENE	7683-64-9
METHAPYRILENE	91-80-5	STYRENE	100-42-5
METHYL METHANESULFONATE	66-27-3	THIANAPHTHENE (2,3-BENZOTHIOPHENE)	95-15-8
NAPHTHALENE	91-20-3	THIOACETAMIDE	62-55-5
N-C10 (N-DECANE)	124-18-5	THIOXANTHONE	492-22-8
		TRIPHENYLENE	217-59-4
		TRIPROPYLENEGLYCOLMETHYL ETHER	20324-33-8

Table 6-6: EPA Sampling Episode List of Analytes Never Detected

		Non-Hazardous Subcategory																Hazardous Subcategory			
		Subtitle D Municipal				Subtitle D Non-Municipal															
POLLUTANT	**CAS NUM**	E4491	E4626	E4667	E4687	E4738	E4503	E4630	E4631	E4638	E4639	E4644	E4683	E4690	E4721	E4631	E4659	E4682	E4690	E4721	E4759
1613: DIOXINS/FURANS																					
2378-TCDD	1746-01-6	ND	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2378-TCDF	51207-31-9	ND	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND		ND	ND		ND	ND
12378-PECDD	40321-76-4	ND	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
12378-PECDF	57117-41-6	ND	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND		ND	ND		ND	ND
23478-PECDF	57117-31-4	ND	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND	ND	ND	ND	ND	ND
123478-HXCDD	39227-28-6	ND	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND	ND	ND	ND	ND	ND
123678-HXCDD	57653-85-7	ND	-	-	ND		ND	ND	ND	ND	ND	ND	ND		ND		ND	ND	ND	ND	ND
123789-HXCDD	19408-74-3	ND	-	-	ND		ND	ND	ND	ND	ND	ND	ND		ND		ND	ND	ND	ND	ND
123478-HXCDF	70648-26-9	ND	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND		ND	ND		ND	ND
123678-HXCDF	57117-44-9	ND	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND		ND	ND		ND	ND
123789-HXCDF	72918-21-9	ND	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND	ND	ND	ND	ND	ND
234678-HXCDF	60851-34-5	ND	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND	ND	ND		ND	ND
1234678-HPCDD	35822-46-9		-	-	ND		ND		ND	ND	ND	ND	ND		ND		ND	ND			ND
1234678-HPCDF	67562-39-4	ND	-	-	ND		ND	ND	ND	ND	ND	ND	ND		ND		ND	ND			ND
1234789-HPCDF	55673-89-7	ND	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND		ND	ND		ND	ND
OCDD	3268-87-9		-	-	ND		ND		ND	ND	ND	ND	ND				ND	ND			ND
OCDF	39001-02-0	ND	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND		ND	ND			ND
1620: METALS																					
ALUMINUM	7429-90-5									ND	ND	ND	ND				ND				
ANTIMONY	7440-36-0				ND	ND	ND	ND	ND			ND		ND		ND	ND				
ARSENIC	7440-38-2								ND		ND		ND								
BARIUM	7440-39-3																				
BERYLLIUM	7440-41-7	ND	ND	ND	ND		ND	ND	ND	ND		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
BISMUTH	7440-69-9	ND		ND	ND	ND		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
BORON	7440-42-8			ND																	
CADMIUM	7440-43-9						ND	ND	ND	ND			ND		ND	ND	ND		ND	ND	
CALCIUM	7440-70-2																				
CERIUM	7440-45-1	ND		ND	ND		ND	ND	ND	ND	ND		ND	ND	ND	ND		ND	ND	ND	ND
CHROMIUM	7440-47-3				ND		ND	ND	ND		ND	ND	ND				ND		ND		
COBALT	7440-48-4		ND		ND				ND	ND	ND	ND	ND		ND						
COPPER	7440-50-8				ND		ND					ND			ND	ND	ND				
DYSPROSIUM	7429-91-6	ND		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
ERBIUM	7440-52-0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND	ND	ND	ND	ND	ND	ND	
EUROPIUM	7440-53-1	ND			ND	ND	ND	ND	ND				ND	ND	ND	ND	ND	ND	ND	ND	
GADOLINIUM	7440-54-2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND	ND	ND	ND	ND	ND	ND	ND
GALLIUM	7440-55-3	ND	ND		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
GERMANIUM	7440-56-4	ND	ND		ND	ND	ND	ND	ND		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
GOLD	7440-57-5	ND		ND	ND	ND	ND	ND	ND		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
HAFNIUM	7440-58-6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
HOLMIUM	7440-60-0	ND		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
INDIUM	7440-74-6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND	ND	ND	ND	ND	ND	ND	ND
IODINE	7553-56-2	ND	ND		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND	ND
IRIDIUM	7439-88-5	ND	ND		ND	ND	ND	ND	ND				ND	ND	ND	ND	ND		ND	ND	ND
IRON	7439-89-6																				
LANTHANUM	7439-91-0	ND	ND	ND	ND		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
LEAD	7439-92-1	ND	ND				ND	ND	ND			ND	ND		ND	ND	ND		ND	ND	
LITHIUM	7439-93-2	ND			ND	ND		ND		ND	ND		ND								
LUTETIUM	7439-94-3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND	ND	ND	ND	ND	ND	ND	ND
MAGNESIUM	7439-95-4																				
MANGANESE	7439-96-5																				
MERCURY	7439-97-6				ND		ND	ND	ND	ND	ND		ND	ND	ND	ND	ND	ND	ND		
MOLYBDENUM	7439-98-7				ND	ND	ND	ND		ND			ND		ND	ND					
NEODYMIUM	7440-00-8	ND	ND	ND	ND		ND	ND	ND		ND		ND	ND	ND	ND	ND	ND	ND	ND	
NICKEL	7440-02-0									ND	ND	ND	ND								
NIOBIUM	7440-03-1	ND			ND	ND	ND	ND	ND				ND	ND	ND	ND		ND	ND	ND	ND
OSMIUM	7440-04-2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PALLADIUM	7440-05-3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
PHOSPHORUS	7723-14-0	ND			ND						ND	ND	ND				ND				
PLATINUM	7440-06-4	ND	ND		ND	ND	ND	ND	ND	ND			ND	ND	ND	ND	ND	ND	ND	ND	ND
POTASSIUM	7440-09-7	ND										ND									
PRASEODYMIUM	7440-10-0	ND	ND		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
RHENIUM	7440-15-5	ND	ND		ND	ND	ND	ND	ND	ND	ND		ND	ND	ND	ND		ND	ND	ND	
RHODIUM	7440-16-6	ND	ND		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND	ND	
RUTHENIUM	7440-18-8	ND	ND		ND	ND	ND	ND	ND		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
SAMARIUM	7440-19-9	ND	ND	ND	ND	ND	ND	ND	ND			ND	ND	ND	ND	ND	ND	ND	ND	ND	
SCANDIUM	7440-20-2	ND			ND	ND	ND	ND	ND				ND	ND	ND	ND	ND	ND	ND	ND	
SELENIUM	7782-49-2	ND			ND	ND	ND	ND			ND	ND	ND	ND	ND		ND				
SILICON	7440-21-3	ND																			

Table 6-6: EPA Sampling Episode List of Analytes Never Detected

		Non-Hazardous Subcategory																Hazardous Subcategory			
		Subtitle D Municipal					Subtitle D Non-Municipal														
POLLUTANT	**CAS NUM**	E4491	E4626	E4667	E4687	E4738	E4503	E4630	E4631	E4638	E4639	E4644	E4683	E4690	E4721	E4631	E4659	E4682	E4690	E4721	E4759
SILVER	7440-22-4	ND	ND		ND	ND	ND		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SODIUM	7440-23-5																				
STRONTIUM	7440-24-6	ND																			
SULFUR	7704-34-9	ND										ND									
TANTALUM	7440-25-7	ND			ND	ND	ND	ND	ND	ND		ND	ND	ND	ND	ND		ND	ND	ND	
TELLURIUM	13494-80-9	ND	ND		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
TERBIUM	7440-27-9	ND	ND		ND	ND	ND	ND	ND	ND	ND		ND	ND	ND	ND	ND	ND	ND	ND	ND
THALLIUM	7440-28-0	ND		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND			ND
THORIUM	7440-29-1	ND	ND		ND	ND	ND	ND	ND		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
THULIUM	7440-30-4	ND	ND	ND	ND	ND	ND	ND	ND		ND		ND	ND	ND	ND	ND	ND	ND	ND	ND
TIN	7440-31-5	ND			ND	ND	ND	ND	ND	ND	ND	ND	ND		ND		ND			ND	
TITANIUM	7440-32-6				ND						ND	ND	ND				ND		ND		
TUNGSTEN	7440-33-7	ND	ND		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND	
URANIUM	7440-61-1	ND	ND		ND	ND	ND	ND	ND	ND	ND		ND	ND	ND	ND	ND	ND	ND	ND	ND
VANADIUM	7440-62-2				ND		ND		ND	ND	ND	ND	ND				ND				
YTTERBIUM	7440-64-4	ND	ND		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND	ND	ND
YTTRIUM	7440-65-5			ND			ND		ND	ND	ND	ND	ND		ND	ND	ND	ND	ND	ND	ND
ZINC	7440-66-6											ND									
ZIRCONIUM	7440-67-7	ND	ND		ND	ND	ND	ND	ND	ND	ND		ND	ND	ND		ND	ND	ND	ND	
1624: VOLATILE ORGANICS																					
1,1-DICHLOROETHANE	75-34-3			ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND			ND				
1,1-DICHLOROETHENE	75-35-4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND
1,1,1-TRICHLOROETHANE	71-55-6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND			ND
1,1,1,2-TETRACHLOROETHANE	630-20-6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND
1,1,2-TRICHLOROETHANE	79-00-5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND
1,1,2,2-TETRACHLOROETHANE	79-34-5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND
1,2-DIBROMOETHANE	106-93-4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-DICHLOROETHANE	107-06-2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND	ND				
1,2-DICHLOROPROPANE	78-87-5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND		ND	ND		ND	ND
1,2,3-TRICHLOROPROPANE	96-18-4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND
1,3-DICHLOROPROPANE	142-28-9	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,4-DIOXANE	123-91-1	ND				ND	ND	ND	ND		ND	ND	ND		ND		ND			ND	
2-BUTANONE (MEK)	78-93-3						ND	ND	ND	ND	ND	ND	ND				ND				
2-CHLORO-1,3-BUTADIENE	126-99-8	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND
2-CHLOROETHYLVINYL ETHER	110-75-8	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-HEXANONE	591-78-6	ND			ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND				ND
2-METHYL-2-PROPENENITRILE	126-98-7	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND
2-PROPANONE (ACETONE)	67-64-1							ND		ND	ND	ND	ND								
2-PROPENAL (ACROLEIN)	107-02-8	ND		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-PROPEN-1-OL (ALLYL ALCOHOL)	107-18-6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND	ND	ND		ND	ND
3-CHLOROPROPENE	107-05-1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4-METHYL-2-PENTANONE	108-10-1	ND				ND	ND	ND	ND	ND	ND	ND	ND	ND			ND				
ACRYLONITRILE	107-13-1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
BENZENE	71-43-2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND			ND				
BROMODICHLOROMETHANE	75-27-4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
BROMOFORM	75-25-2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
BROMOMETHANE	74-83-9	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
CARBON DISULFIDE	75-15-0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND	ND	ND		ND	
CHLOROACETONITRILE	107-14-2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND
CHLOROBENZENE	108-90-7	ND	ND		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND	ND			ND
CHLOROETHANE	75-00-3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND			ND	ND		ND	ND
CHLOROFORM	67-66-3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND
CHLOROMETHANE	74-87-3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
CIS-1,3-DICHLOROPROPENE	10061-01-5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND
CROTONALDEHYDE	4170-30-3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DIBROMOCHLOROMETHANE	124-48-1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DIBROMOMETHANE	74-95-3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DIETHYL ETHER	60-29-7	ND		ND		ND	ND	ND	ND	ND	ND	ND	ND	ND			ND		ND		ND
ETHYL BENZENE	100-41-4						ND	ND	ND	ND	ND	ND	ND	ND			ND				
ETHYL CYANIDE	107-12-0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
ETHYL METHACRYLATE	97-63-2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
IODOMETHANE	74-88-4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
ISOBUTYL ALCOHOL	78-83-1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND			ND	
METHYLENE CHLORIDE	75-09-2				ND		ND	ND	ND	ND	ND	ND	ND		ND		ND				
M-XYLENE	108-38-3				ND		ND	ND	ND	ND	ND	ND	ND	ND			ND		ND		
O+P XYLENE	136777-61-2				ND	ND	ND	ND	ND	ND	ND	ND	ND	ND			ND		ND		ND
TETRACHLOROETHENE	127-18-4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND				ND
TETRACHLOROMETHANE	56-23-5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND			ND
TOLUENE	108-88-3								ND	ND	ND	ND	ND	ND			ND				

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		Non-Hazardous Subcategory															Hazardous Subcategory				
		Subtitle D Municipal				Subtitle D Non-Municipal															
POLLUTANT	**CAS NUM**	E4491	E4626	E4667	E4687	E4738	E4503	E4630	E4631	E4638	E4639	E4644	E4683	E4690	E4721	E4631	E4659	E4682	E4690	E4721	E4759
TRANS-1,2-DICHLOROETHENE	156-60-5	ND			ND	ND	ND	ND	ND	ND	ND	ND	ND	ND			ND				ND
TRANS-1,3-DICHLOROPROPENE	10061-02-6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
TRANS-1,4-DICHLORO-2-BUTENE	110-57-6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
TRICHLOROETHENE	79-01-6	ND	ND		ND	ND	ND	ND	ND		ND	ND	ND	ND	ND		ND				ND
TRICHLOROFLUOROMETHANE	75-69-4	ND	ND	ND		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
VINYL ACETATE	108-05-4	ND	ND		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
VINYL CHLORIDE	75-01-4	ND				ND	ND	ND	ND	ND	ND	ND	ND	ND			ND				ND
1625: SEMIVOLATILE ORGANICS																					
1-METHYLFLUORENE	1730-37-6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1-METHYLPHENANTHRENE	832-69-9	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1-PHENYLNAPHTHALENE	605-02-7	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-DIBROMO-3-CHLOROPROPANE	96-12-8	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-DICHLOROBENZENE	95-50-1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND	ND	ND		ND
1,2-DIPHENYLHYDRAZINE	122-66-7	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		
1,2,3-TRICHLOROBENZENE	87-61-6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,3-TRIMETHOXYBENZENE	634-36-6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,4-TRICHLOROBENZENE	120-82-1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,4,5-TETRACHLOROBENZENE	95-94-3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2:3,4-DIEPOXYBUTANE	1464-53-5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,3-BENZENEDIOL (RESORCINOL)	108-46-3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,3-DICHLORO-2-PROPANOL	96-23-1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,3-DICHLOROBENZENE	541-73-1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,3,5-TRITHIANE	291-21-4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND	ND	ND		ND
1,4-DICHLOROBENZENE	106-46-7		ND		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND	ND	ND		ND
1,4-DINITROBENZENE	100-25-4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,4-NAPHTHOQUINONE	130-15-4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,5-NAPHTHALENEDIAMINE	2243-62-1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-BROMOCHLOROBENZENE	694-80-4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-CHLORONAPHTHALENE	91-58-7	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-CHLOROPHENOL	95-57-8	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-ISOPROPYLNAPHTHALENE	2027-17-0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-METHYL-4,6-DINITROPHENOL	534-52-1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND
2-METHYLBENZOTHIOAZOLE	120-75-2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-METHYLNAPHTHALENE	91-57-6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND
2-NITROANILINE	88-74-4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-NITROPHENOL	88-75-5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND	ND	ND
2-PHENYLNAPHTHALENE	612-94-2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-PICOLINE	109-06-8			ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		
2-(METHYLTHIO)BENZOTHIAZOLE	615-22-5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND	ND	ND	ND
2,3-BENZOFLUORENE	243-17-4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2,3-DICHLOROANILINE	608-27-5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2,3-DICHLORONITROBENZENE	3209-22-1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2,3,4,6-TETRACHLOROPHENOL	58-90-2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2,3,6-TRICHLOROPHENOL	933-75-5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2,4-DIAMINOTOLUENE	95-80-7	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2,4-DICHLOROPHENOL	120-83-2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2,4-DIMETHYLPHENOL	105-67-9	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND			ND		
2,4-DINITROPHENOL	51-28-5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND	ND	ND
2,4-DINITROTOLUENE	121-14-2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2,4,5-TRICHLOROPHENOL	95-95-4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2,4,5-TRIMETHYLANILINE	137-17-7	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2,4,6-TRICHLOROPHENOL	88-06-2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2,6-DICHLORO-4-NITROANILINE	99-30-9	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2,6-DICHLOROPHENOL	87-65-0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2,6-DINITROTOLUENE	606-20-2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND	ND
2,6-DI-TERT-BUTYL-P-BENZOQUINONE	719-22-2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
3-BROMOCHLOROBENZENE	108-37-2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
3-CHLORONITROBENZENE	121-73-3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
3-METHYLCHOLANTHRENE	56-49-5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
3-NITROANILINE	99-09-2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
3,3-DICHLOROBENZIDINE	91-94-1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
3,3'-DIMETHOXYBENZIDINE	119-90-4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
3,5-DIBROMO-4-HYDROXYBENZONITRILE	1689-84-5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
3,6-DIMETHYLPHENANTHRENE	1576-67-6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4-AMINOBIPHENYL	92-67-1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4-BROMOPHENYL PHENYL ETHER	101-55-3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4-CHLORO-2-NITROANILINE	89-63-4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4-CHLORO-3-METHYLPHENOL	59-50-7	ND	ND	ND		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND	ND
4-CHLOROANILINE	106-47-8	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Table 6-6: EPA Sampling Episode List of Analytes Never Detected

		Non-Hazardous Subcategory															Hazardous Subcategory				
		Subtitle D Municipal					Subtitle D Non-Municipal														
POLLUTANT	**CAS NUM**	E4491	E4626	E4667	E4687	E4738	E4503	E4630	E4631	E4638	E4639	E4644	E4683	E4690	E4721	E4631	E4659	E4682	E4690	E4721	E4759
4-CHLOROPHENYL PHENYL ETHER	7005-72-3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4-NITROANILINE	100-01-6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4-NITROBIPHENYL	92-93-3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4-NITROPHENOL	100-02-7	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND	ND	ND
4,4-METHYLENE-BIS(2-CHLOROANILINE)	101-14-4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4,5-METHYLENE-PHENANTHRENE	203-64-5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
5-CHLORO-O-TOLUIDINE	95-79-4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
5-NITRO-O-TOLUIDINE	99-55-8	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
7,12-DIMETHYLBENZ(A)ANTHRACENE	57-97-6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
ACENAPHTHENE	83-32-9	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND	ND		ND
ACENAPHTHYLENE	208-96-8	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
ACETOPHENONE	98-86-2	ND		ND		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND		ND	ND
ALPHA-NAPHTHYLAMINE	134-32-7	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND	ND	ND	ND	ND
ALPHA-TERPINEOL	98-55-5					ND	ND	ND	ND	ND	ND	ND	ND	ND				ND	ND		ND
ANILINE	62-53-3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND			ND		ND		
ANTHRACENE	120-12-7	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
ARAMITE	140-57-8	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
BENZANTHRONE	82-05-3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
BENZENETHIOL	108-98-5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
BENZIDINE	92-87-5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
BENZOIC ACID	65-85-0	ND				ND	ND	ND	ND	ND	ND	ND	ND		ND						
BENZO(A)ANTHRACENE	56-55-3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
BENZO(A)PYRENE	50-32-8	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
BENZO(B)FLUORANTHENE	205-99-2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
BENZO(GHI)PERYLENE	191-24-2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
BENZO(K)FLUORANTHENE	207-08-9	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
BENZYL ALCOHOL	100-51-6	ND		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND		
BETA-NAPHTHYLAMINE	91-59-8		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND	ND	ND	ND	ND
BIPHENYL	92-52-4	ND	ND	ND	ND		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
BIS(2-CHLOROETHOXY) METHANE	111-91-1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
BIS(2-CHLOROETHYL) ETHER	111-44-4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND
BIS(2-CHLOROISOPROPYL) ETHER	108-60-1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND
BIS(2-ETHYLHEXYL) PHTHALATE	117-81-7	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND	ND	ND	ND
BUTYL BENZYL PHTHALATE	85-68-7	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
CARBAZOLE	86-74-8	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
CHRYSENE	218-01-9	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
CROTOXYPHOS	7700-17-6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DIBENZOFURAN	132-64-9	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND	ND	ND	ND
DIBENZOTHIOPHENE	132-65-0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DIBENZO(A,H)ANTHRACENE	53-70-3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DIETHYL PHTHALATE	84-66-2	ND		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DIMETHYL PHTHALATE	131-11-3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DIMETHYL SULFONE	67-71-0	ND		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DI-N-BUTYL PHTHALATE	84-74-2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DI-N-OCTYL PHTHALATE	117-84-0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DIPHENYL ETHER	101-84-8	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND	ND	ND	ND
DIPHENYLAMINE	122-39-4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DIPHENYLDISULFIDE	882-33-7	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
ETHYL METHANESULFONATE	62-50-0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
ETHYLENETHIOUREA	96-45-7	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
ETHYNYLESTRADIOL-3-METHYL ETHER	72-33-3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
FLUORANTHENE	206-44-0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND	ND	ND	ND
FLUORENE	86-73-7	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND	ND		ND
HEXACHLOROBENZENE	118-74-1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
HEXACHLOROBUTADIENE	87-68-3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
HEXACHLOROCYCLOPENTADIENE	77-47-4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
HEXACHLOROETHANE	67-72-1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
HEXACHLOROPROPENE	1888-71-7	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
HEXANOIC ACID	142-62-1	ND					ND		ND	ND	ND	ND	ND		ND				ND		
INDENO(1,2,3-CD)PYRENE	193-39-5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
ISOPHORONE	78-59-1			ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
ISOSAFROLE	120-58-1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
LONGIFOLENE	475-20-7	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MALACHITE GREEN	569-64-2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
METHAPYRILENE	91-80-5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
METHYL METHANESULFONATE	66-27-3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
NAPHTHALENE	91-20-3		ND		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND			ND		ND		
N-C10 (N-DECANE)	124-18-5		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND	ND	ND	ND
N-C12 (N-DODECANE)	112-40-3	ND		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND	ND	ND	ND
N-C14 (N-TETRADECANE)	629-59-4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND	ND		ND

Table 6-6: EPA Sampling Episode List of Analytes Never Detected

								Non-Hazardous Subcategory											Hazardous Subcategory		
				Subtitle D Municipal							Subtitle D Non-Municipal										
POLLUTANT	**CAS NUM**	E4491	E4626	E4667	E4687	E4738	E4503	E4630	E4631	E4638	E4639	E4644	E4683	E4690	E4721	E4631	E4659	E4682	E4690	E4721	E4759
N-C16 (N-HEXADECANE)	544-76-3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND	ND	ND	ND
N-C18 (N-OCTADECANE)	593-45-3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND	ND	ND	ND
N-C20 (N-EICOSANE)	112-95-8	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND	ND	ND	ND
N-C22 (N-DOCOSANE)	629-97-0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND	ND	ND	ND
N-C24 (N-TETRACOSANE)	646-31-1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND	ND	ND	ND
N-C26 (N-HEXACOSANE)	630-01-3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND	ND	ND	ND
N-C28 (N-OCTACOSANE)	630-02-4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND	ND	ND	ND
N-C30 (N-TRIACONTANE)	638-68-6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
NITROBENZENE	98-95-3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
N-NITROSODIETHYLAMINE	55-18-5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
N-NITROSODIMETHYLAMINE	62-75-9	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
N-NITROSODI-N-BUTYLAMINE	924-16-3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
N-NITROSODI-N-PROPYLAMINE	621-64-7	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
N-NITROSODIPHENYLAMINE	86-30-6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
N-NITROSOMETHYL -ETHYLAMINE	10595-95-6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
N-NITROSOMETHYL-PHENYLAMINE	614-00-6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
N-NITROSOMORPHOLINE	59-89-2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
N-NITROSOPIPERIDINE	100-75-4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
N,N-DIMETHYLFORMAMIDE	68-12-2	ND			ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND	ND	ND	ND
O-ANISIDINE	90-04-0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
O-CRESOL	95-48-7	ND	ND		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND			ND			
O-TOLUIDINE	95-53-4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
P-CRESOL	106-44-5	ND		ND			ND	ND	ND	ND	ND	ND	ND				ND		ND		
P-CYMENE	99-87-6	ND			ND	ND		ND	ND	ND	ND	ND	ND	ND			ND	ND	ND		ND
P-DIMETHYLAMINO-AZOBENZENE	60-11-7	ND		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PENTACHLOROBENZENE	608-93-5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PENTACHLOROETHANE	76-01-7	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PENTACHLOROPHENOL	87-86-5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PENTAMETHYLBENZENE	700-12-9	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PERYLENE	198-55-0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PHENACETIN	62-44-2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PHENANTHRENE	85-01-8	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND	ND		ND
PHENOL	108-95-2					ND	ND	ND		ND	ND	ND	ND								
PHENOTHIAZINE	92-84-2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PRONAMIDE	23950-58-5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PYRENE	129-00-0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND	ND	ND	ND
PYRIDINE	110-86-1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		
SAFROLE	94-59-7	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SQUALENE	7683-64-9	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
STYRENE	100-42-5	ND		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
THIANAPHTHENE (2,3-BENZOTHIOPHENE)	95-15-8	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
THIOACETAMIDE	62-55-5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
THIOXANTHONE	492-22-8	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
TRIPHENYLENE	217-59-4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
TRIPROPYLENEGLYCOLMETHYL ETHER	20324-33-8	ND		ND			ND	ND	ND	ND	ND	ND	ND	ND			ND	ND	ND		
1656: PESTICIDES/HERBICIDES																					
ACEPHATE	30560-19-1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
ACIFLUORFEN	50594-66-6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
ALACHLOR	15972-60-8	ND	ND	ND		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND	ND	ND
ALDRIN	309-00-2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
ATRAZINE	1912-24-9	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND	ND			
BENFLURALIN	1861-40-1	ND	ND	ND		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
ALPHA-BHC	319-84-6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND	ND		ND	
BETA-BHC	319-85-7	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		
GAMMA-BHC	58-89-9		ND	ND		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		
DELTA-BHC	319-86-8	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND	ND	ND		
BROMACIL	314-40-9	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND	ND
BROMOXYNIL OCTANOATE	1689-99-2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
BUTACHLOR	23184-66-9	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND	
CAPTAFOL	2425-06-1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
CAPTAN	133-06-2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
CARBOPHENOTHION	786-19-6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
ALPHA-CHLORDANE	5103-71-9	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
GAMMA-CHLORDANE	5103-74-2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
CHLOROBENZILATE	510-15-6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND		
CHLORONEB	2675-77-6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
CHLOROPROPYLATE	5836-10-2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
CHLOROTHALONIL	1897-45-6	ND	ND	ND		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	
DIBROMOCHLOROPROPANE (DBCP)	96-12-8	ND		ND		ND	ND		ND	ND	ND	ND	ND	ND	ND		ND		ND	ND	

Table 6-6: EPA Sampling Episode List of Analytes Never Detected

		Non-Hazardous Subcategory															Hazardous Subcategory				
		Subtitle D Municipal					Subtitle D Non-Municipal														
POLLUTANT	**CAS NUM**	E4491	E4626	E4667	E4687	E4738	E4503	E4630	E4631	E4638	E4639	E4644	E4683	E4690	E4721	E4631	E4659	E4682	E4690	E4721	E4759
DACTHAL (DCPA)	1861-32-1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
4,4'-DDD	72-54-8	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4,4'-DDE	72-55-9	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
4,4'-DDT	50-29-3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND			ND	ND	ND		
DIALLATE A	2303-16-4A	ND	ND	ND		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND	ND		ND
DIALLATE B	2303-16-4B	ND	ND	ND		ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND	ND	ND		
DICHLONE	117-80-6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DICOFOL	115-32-2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DIELDRIN	60-57-1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
ENDOSULFAN I	959-98-8	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND	ND	ND	ND	ND
ENDOSULFAN II	33213-65-9	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
ENDOSULFAN SULFATE	1031-07-8	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND	ND	ND		ND
ENDRIN	72-20-8	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND	ND
ENDRIN ALDEHYDE	7421-93-4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND
ENDRIN KETONE	53494-70-5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
ETHALFLURALIN	55283-68-6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND	ND	ND	
ETRADIAZOLE	2593-15-9	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
FENARIMOL	60168-88-9	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
HEPTACHLOR	76-44-8	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND		
HEPTACHLOR EPOXIDE	1024-57-3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		
ISODRIN	465-73-6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND
ISOPROPALIN	33820-53-0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND	ND	ND	ND
KEPONE	143-50-0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
METHOXYCHLOR	72-43-5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
METRIBUZIN	21087-64-9	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
MIREX	2385-85-5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
NITROFEN	1836-75-5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
NORFLUORAZON	27314-13-2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB-1016	12674-11-2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB-1221	11104-28-2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB-1232	11141-16-5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB-1242	53469-21-9	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB-1248	12672-29-6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB-1254	11097-69-1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB-1260	11096-82-5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PENTACHLORONITROBENZENE (PCNB)	82-68-8	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
PENDAMETHALIN	40487-42-1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
CIS-PERMETHRIN	61949-76-6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
TRANS-PERMETHRIN	61949-77-7	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PERTHANE	72-56-0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
PROPACHLOR	1918-16-7	ND	ND	ND		ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND	ND	ND	ND	
PROPANIL	709-98-8	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PROPAZINE	139-40-2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND	ND	ND		
SIMAZINE	122-34-9	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND	ND			
STROBANE	8001-50-1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
TERBACIL	5902-51-2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
TERBUTHYLAZINE	5915-41-3	ND	ND	ND			ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND				
TOXAPHENE	8001-35-2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
TRIADIMEFON	43121-43-3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
TRIFLURALIN	1582-09-8	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND	ND	ND	
1657: PESTICIDES/HERBICIDES																					
AZINPHOS ETHYL	2642-71-9	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
AZINPHOS METHYL	86-50-0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
CHLORFEVINPHOS	470-90-6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
CHLORPYRIFOS	2921-88-2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
COUMAPHOS	56-72-4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
CROTOXYPHOS	7700-17-6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DEF	78-48-8	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DEMETON A	8065-48-3A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND		
DEMETON B	8065-48-3B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DIAZINON	333-41-5		ND			ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND		
DICHLORFENTHION	97-17-6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND	ND
DICHLORVOS	62-73-7	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
DICROTOPHOS	141-66-2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND	
DIMETHOATE	60-51-5	ND			ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DIOXATHION	78-34-2	ND	ND	ND		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DISULFOTON	298-04-4	ND	ND				ND	ND	ND		ND		ND	ND	ND	ND	ND		ND	ND	ND
EPN	2104-64-5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
ETHION	563-12-2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Table 6-6: EPA Sampling Episode List of Analytes Never Detected

		Non-Hazardous Subcategory																Hazardous Subcategory			
		Subtitle D Municipal					Subtitle D Non-Municipal														
POLLUTANT	**CAS NUM**	E4491	E4626	E4667	E4687	E4738	E4503	E4630	E4631	E4638	E4639	E4644	E4683	E4690	E4721	E4631	E4659	E4682	E4690	E4721	E4759
ETHOPROP	13194-48-8	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
FAMPHUR	52-85-7	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
FENSULFOTHION	115-90-2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
FENTHION	55-38-9	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
HEXAMETHYLPHOSPHORAMIDE	680-31-9	ND	ND	ND		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND	
LEPTOPHOS	21609-90-5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MALATHION	121-75-5		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND
MERPHOS	150-50-5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND
METHAMIDOPHOS	10265-92-6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND	ND
METHYL CHLORPYRIFOS	5598-13-0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
METHYL PARATHION	298-00-0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND
METHYL TRITHION	953-17-3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MEVINPHOS	7786-34-7	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MONOCROTOPHOS	6923-22-4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
NALED	300-76-5	ND	ND	ND		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND
PARATHION (ETHYL)	56-38-2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PHORATE	298-02-2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PHOSMET	732-11-6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PHOSPHAMIDON E	297-99-4	ND	ND	ND		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND	
PHOSPHAMIDON Z	23783-98-4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
RONNEL	299-84-3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SULFOTEPP	3689-24-5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SULPROFOS	35400-43-2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
TEPP	107-49-3		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND	ND
TERBUFOS	13071-79-9	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
TETRACHLORVINPHOS	22248-79-9	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
TOKUTHION	34643-46-4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND
TRICHLORFON	52-68-6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
TRICHLORONATE	327-98-0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
TRICRESYLPHOSPHATE	78-30-8	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
TRIMETHYLPHOSPHATE	512-56-1		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND	
1658: PESTICIDES/HERBICIDES																					
DALAPON	75-99-0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND	ND	ND		ND		ND	ND
DICAMBA	1918-00-9		ND					ND	ND	ND	ND	ND	ND								
DICHLOROPROP	120-36-5	ND	ND					ND	ND	ND	ND	ND	ND								
DINOSEB	88-85-7	ND	ND	ND	ND	ND		ND	ND	ND	ND	ND	ND		ND		ND	ND			
MCPA	94-74-6							ND	ND		ND		ND								
MCPP	7085-19-0					ND	ND	ND	ND		ND		ND			ND			ND		
PICLORAM	1918-02-1	ND	ND	ND	ND	ND		ND	ND	ND	ND	ND	ND		ND	ND	ND			ND	
2,4-D	94-75-7		ND			ND		ND	ND	ND	ND	ND	ND				ND				
2,4-DB	94-82-6		ND	ND		ND		ND	ND	ND	ND	ND	ND		ND						
2,4,5-T	93-76-5	ND	ND					ND	ND	ND	ND	ND	ND			ND	ND				
2,4,5-TP	93-72-1		ND			ND		ND	ND	ND	ND		ND								
CLASSSICAL WET CHEMISTRY																					
AMENABLE CYANIDE	C-025	ND		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND	
AMMONIA NITROGEN	7664-41-7										ND										
BOD	C-002													ND							
CHLORIDE	16887-00-6	ND																			
COD	C-004																				
FLUORIDE	16984-48-8																				
HEXANE EXTRACTABLE MATERIAL	C-036	-					-		ND	ND	ND	ND	ND				ND				
HEXAVALENT CHROMIUM	18540-29-9					ND		ND	ND	ND	ND	ND	ND	ND		ND		ND	ND		
NITRATE/NITRITE	C-005																				
PH	C-006																				
RECOVERABLE OIL AND GREASE	C-007		-	-	-	-		-	-	-	-	ND	-	-	-	-	ND	-	-	-	-
TDS	C-010																				
TOC	C-012										ND	ND	ND				ND				
TOTAL CYANIDE	57-12-5			ND	ND	ND	ND				ND	ND	ND	ND					ND		
TOTAL PHENOLS	C-020							ND					ND								
TOTAL PHOSPHORUS	14265-44-2								ND	ND	ND		ND				ND				
TOTAL SOLIDS	C-008	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ND	-	-	-	-
TOTAL SULFIDE	18496-25-8		-										ND	ND							
TSS	C-009										ND	ND	ND								

Table 6-7: Subtitle D Non-Hazardous Subcategory Master File

Subtitle D Non-Hazardous Pollutant of Interest	Subtitle D Municipal Median Concentration (ug/l)	Subtitle D Non-Municipal Median Concentration (ug/l)
Conventional		
BOD	209,786	67,000
TSS	150,000	20,500
Classical (Non-Conventional)		
Ammonia as Nitrogen	81,717	75,000
COD	1,023,000	1,100,000
Hexavalent Chromium	64.9	
Nitrate/Nitrite	651	950
TDS	2,894,289	4,850,000
TOC	376,521	236,000
Total Phenols	637	251
Organic (Toxic & Non-Conventional)		
1,4-Dioxane	10.8	
2-Butanone	1,768	
2-Propanone	991	
4-Methyl-2-Pentanone	100	
Alpha-Terpineol	123	
Benzoic Acid	3,897	
Hexanoic Acid	5,818	
Methylene Chloride	36.8	
N,N-Dimethylformamide	10	
O-Cresol	15	
P-Cresol	75	
Phenol	101	
Toluene	108	
Tripropyleneglycol Methyl Ether	197	
Metals (Toxic & Non-Conventional)		
Barium	482	
Chromium	28.2	
Strontium	1,671	4,615
Titanium	63.8	
Zinc	140	
Pesticides/Herbicides (Non-Conventional)		
Dichloroprop	6.1	
Disulfoton	6.1	
MCPA		403
Dioxins/Furans (Non-Conventional)		
1234678-HpCDD	0.00014	
OCDD	0.0018	

Table 6-8: Subtitle C Hazardous Subcategory Raw Wastewater Master File

Subtitle C Hazardous Pollutant of Interest	Median Conc. (ug/l)	Subtitle C Hazardous Pollutant of Interest	Median Conc. (ug/l)
Conventional		**Organics (cont.)**	
BOD	101,000	Toluene	347
Hexane Extractable Material	35,500	Trans-1,2-Dichloroethene	78.7
TSS	67,655	Trichloroethene	250
Classical (Non-Conventional)		Tripropyleneglycol Methyl Ether	808
Amenable Cyanide	1,638	Vinyl Chloride	42.7
Ammonia as Nitrogen	8,600	**Metals (Toxic & Non-Coventional)**	
COD	1,199,500	Arsenic	190
Nitrate/Nitrite	5,500		
TDS	12,628,750	Chromium	47.8
TOC	409,547	Copper	36.4
Total Phenols	25,004	Lithium	830
Organics (Toxic & Non-Conventional)		Molybdenum	157
1,1-Dichloroethane	51.5	Nickel	302
1,4-Dioxane	235	Selenium	20
2,4-Dimethylphenol	70.3		
2-Butanone	1,464	Strontium	1500
2-Propanone	2,882	Tin	57.2
4-Methyl-2-Pentanone	580	Titanium	36.5
Alpha-Terpineol	91.2	Total Cyanide	50.1
Aniline	149	Zinc	218
Benzene	98.7	**Pesticides/Herbicides (Non-Coventional)**	
Benzoic Acid	1,001	2,4,5-TP	4.1
Benzyl Alcohol	55	2,4-D	5.1
Diethyl Ether	60.8	2,4-DB	18.5
Ethylbenzene	100	Dicamba	4.9
Hexanoic Acid	593	Dichloroprop	8.6
Isobutyl Alcohol	19.6	MCPA	383
Methylene Chloride	324	MCPP	870
M-Xylene	41.4	Picloram	5.8
Napthalene	58.8	Terbuthylazine	14.5
O+P Xylene	17.1	**Dioxins/Furans (Non-Conventional)**	
O-Cresol	61.4	1234678-HpCDD	0.00018
Phenol	562	1234678-HpCDF	0.00013
Pyridine	61	OCDD	0.00035
P-Cresol	120	OCDF	0.0019

Table 6-9: Range of Conventional and Selected Nonconventional Pollutants Raw Wastewater Concentrations (ug/l)

		Non-Hazardous Subcategory								Hazardous Subcategory			
		Subtitle D Municipal				Subtitle D Non-Municipal							
Pollutant	Cas No.	Min	Max	#Obs	#ND	Min	Max	#Obs	#ND	Min	Max	#Obs	#ND
Amenable Cyanide	C-025									0.01	29,895	4	2
Biological Oxygen Demand (BOD)	C-002	10,500	7,609,318	31	0	1,000	3,799,333	9	1	11,190	6,500,000	16	0
Total Suspended Solids (TSS)	C-009	6,500	14,470,000	26	0	4,000	16,500,000	8	2	14,840	18,500,000	17	0
pH	C-006	6.7	9.8	5	0	6.6	9.2	9	0	5.8	11	6	0
Hexane Extractable Material	C-036	5,000	26,000	4	0	5,000	64,000	9	4	5,000	686,889	5	1
Ammonia as Nitrogen	7664417	1,782	2,900,000	24	0	100	5,860,000	9	1	362	550,781	13	0
Chemical Oxygen Demand (COD)	C-004	35,000	11,881,700	28	0	80,000	16,700,000	9	0	47,300	10,400,000	16	0
Nitrate/Nitrite	C-005	20	50,800	17	3	50	36,000	9	1	380	300,040	11	0
Total Dissolved Solids (TDS)	C-010	752,000	17,533,000	22	0	936,000	33,900,000	9	0	128,500	31,898,889	13	0
Total Organic Carbon (TOC)	C-012	9,400	3,446,084	22	0	10,000	4,820,000	9	2	2,000	3,824,286	16	2
Total Phenols	C-020	146	2,051,249	14	0	50	39,200	9	1	280	121,735	5	0
Total Phosphorus	14265442	17	6,500	6	0	10	22,700	7	2	10	310,000	12	1

#Obs: Number of observations

#ND: Number of non-detects

Table 6-10: Range of Metals and Toxic Pollutants Raw Wastewater Concentrations (ug/l)

		Non-Hazardous Subcategory								Hazardous Subcategory			
		Subtitle D Municipal				Subtitle D Non-Municipal							
Pollutant	Cas No.	Min	Max	#Obs	#ND	Min	Max	#Obs	#ND	Min	Max	#Obs	#ND
Aluminum	7429905	60.5	111,100	7	0	21.5	712,000	8	3				
Arsenic	7440382					1.9	18,300	10	3	2.4	1,370	16	2
Barium	7440393	43	3,500	19	1	140	3,570	10	0				
Boron	7440428	696	5,704	7	0	75.9	16,250	8	0	73.6	14,950	15	0
Chromium	7440473	2	240	27	9					10	112,600	14	3
Chromium (Hexavalent)	18540299	10	4,291	9	3								
Copper	7440508									9	8,502	15	4
Iron	7439896	2,494	1,667,600	27	0	556	100,000	8	0	3,585	763,000	15	0
Lithium	7439932									182	9,400	10	0
Magnesium	7439954	24,100	212,480	14	0	8,139	388,000	9	0	2,885	1,156,000	14	0
Manganese	7439965	149	78,820	20	0	471	7,151	9	0	0.7	328,600	14	0
Molybdenum	7439987					4.2	69.3	8	4	9	18,757	12	2
Nickel	7440020									18.5	19,520	16	0
Phosphorus	7723140									593	118,000	12	1
Selenium	7782492									2	347	13	5
Silicon	7440213	1,034	91,100	4	0	2,498	159,000	8	0	7	30,400	14	0
Strontium	7440246	787	2,146	4	0	277	30,100	8	0	0.7	30,839	13	0
Sulfur	7704349	3,969	107,999	4	0	13,700	386,573	7	0	2.4	5,792,000	14	0
Tin	7440315									30.2	1,118	9	2
Titanium	7440326	4	157	6	1	4.4	1,740	8	2	3.4	764	13	2
Total Cyanide	57125									10	13,317	12	0
Zinc	7440666	11.5	31,813	27	1	2	1,240	10	1	22	49,200	18	0

#Obs: Number of observations

#ND: Number of non-detects

Table 6-11: Range of Organic Pollutants Raw Wastewater Concentrations (ug/l)

		Non-Hazardous Subcategory								Hazardous Subcategory			
		Subtitle D Municipal				Subtitle D Non-Municipal							
Pollutant	Cas No.	Min	Max	#Obs	#ND	Min	Max	#Obs	#ND	Min	Max	#Obs	#ND
1,1-Dichloroethane	75343									0.5	56,887	15	4
1,4-Dioxane	123911	10	323	5	2					10	7,611	13	6
1234678-HpCDD	35822469	0.00005	0.007	3	1					0.00005	0.007	6	2
1234678-HpCDF	67562394									0.00005	0.022	6	2
2,4-D	94757									0.5	310	9	4
2,4-DB	94826									2.87	120	6	1
2,4-Dimethylphenol	105679									10	2,546	12	5
2,4,5-TP	93721									0.1	10	9	4
2-Butanone	78933	19.3	36,544	14	3					50	15,252	14	4
2-Propanone	67641	50	8,614	12	4	50	780	10	6	61.2	52,518	18	2
4-Methyl-2-Pentanone	108101	35	46,161	13	4					18	12,067	16	4
Alpha-Terpineol	98555	10	1,061	5	1					10	654	6	3
Aniline	62533									10	2,500	10	5
Benzene	71432									0.3	19,396	18	6
Benzoic Acid	65850	50	33,335	7	3					50	2,316,700	12	1
Benzyl Alcohol	100516									10	13,308	11	5
Dicamba	1918009									0.49	31	6	0
Dichloroprop	120365	1	29.1	5	2					2.188	44.3	6	1
Diethyl Ether	60297									10	4,200	12	6
Disulfoton	298044	2.3	19.7	5	2								
Ethyl Benzene	100414									0.5	10,212	16	5
Hexanoic Acid	142621	10	37,256	5	1					13.334	31,086	10	0
Isobutyl Alcohol	78831									10	10,000	10	6
MCPA	94746					50	4370	8	2	14.458	7,071	6	1
MCPP	7085190					50	1900	8	4	12.752	12,887	6	2
Methylene Chloride	75092	1.6	5,091	20	6					1	59,823	15	5
M-Xylene	108383									10	650	8	2
Naphthalene	91203									10	7,799	14	4
N,N-Dimethylformamide	68122	10	1,008	5	3								
OCDD	3268879	0.0001	0.082	3	1	0.0001	0.0176	8	5	0.0001	0.062	7	2
OCDF	39001020									0.0001	0.591	6	2
O-Cresol	95487	1	2,215	8	6					10	500	11	2
O+P Xylene	136777612									10	230	6	2
P-Cresol	106445	1	998	9	3					10	17,396	10	2
Phenol	108952	2	1,425	14	5					10	1,548,330	15	1
Picloram	1918021									0.5	8.5	5	2
Pyridine	110861									10	10,000	9	6
Terbuthylazine	5915413									5	123,226	5	2
Toluene	108883	3	598	23	5					5	18,166	21	4
Trans-1,2-Dichloroethene	156605									0.4	40,286	15	4
Trichloroethene	79016									0.5	123,613	17	4
Tripropyleneglycol Methyl Ether	20324338	99	1,235	5	2					99	3,182	6	3
Vinyl Chloride	75014									0.2	5,170	10	5

#Obs: Number of observations
#ND: Number of non-detects

Table 6-12: Dioxins and Furans at Non-Hazardous EPA Sampling Episodes by Episode and Sample Point

Subtitle D Episode/SP	Sample Type	1234678-HpCDD	1234678-HpCDF	OCDD	OCDF	123478-HxCDD	123478-HxCDF	1234789-HpCDF	123678-HxCDD	123678-HxCDF	12378-PeCDD	12378-PeCDF	123789-HxCDD	123789-HxCDF	234678-HxCDF	23478-PeCDF	2378-TCDD	2378-TCDF
Municipal																		
4491 sp01 - inf	grab	140 pg/l	ND	1800 pg/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4626 sp01 - inf	-	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
4626 sp02 - inf	-	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
4626 sp03 - inf	-	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
4626 sp08 - eff	-	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
4626 sp09 - FC	grab	32.9 ng/kg	ND	803 ng/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4626 sp09 - FC	grab	41.2 ng/kg	ND	1100 ng/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4667 sp01 - inf	-	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
4667 sp06 - eff	-	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
4667 sp07 - FC	grab	29 ng/kg	ND	279 ng/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4667 sp07 - FC	grab	32 ng/kg	ND	271 ng/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4667 sp07 - FC	grab	44 ng/kg	ND	308 ng/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4667 sp07 - FC	grab	43 ng/kg	ND	338 ng/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4667 sp07 - FC	grab	39 ng/kg	ND	290 ng/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4687 sp01 - inf	comp	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4687 sp03 - eff	comp	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
4738 sp01 - inf	grab	240 pg/l	56 pg/l	11,000 pg/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4738 sp02 - inf	grab	480 pg/l	ND	5,300 ng/kg	ND	ND	ND	ND	6 ng/kg	ND	ND	ND	16 ng/kg	ND	ND	ND	ND	ND
Non-Municipal																		
4503 sp01 - inf	grab	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4630 sp01 - inf	grab	103 pg/l	ND	5380 pg/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4631 sp03 - inf	grab	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4638 sp01 - inf	grab	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4639 sp01 - inf	grab	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4644 sp01 - inf	grab	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4721 sp04 - inf	grab	ND	ND	503 pg/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Note: Only filter cake was analyzed for dioxins and furans in Municipal episodes 4626 and 4667

sp: sample point	comp: composite sample	NS: Not sampled	mg/l = 1000 ug/l
inf: influent	grab: grab sample	ND: Non-detect	ug/l = 1000 ng/l
eff: effluent		FC: Filter cake	ng/l = 1000 pg/l

Table 6-13: Dioxins and Furans at Hazardous EPA Sampling Episodes by Episode and Sample Point

Episode Sample Point	Sample Type	1234678-HpCDD	1234678-HpCDF	OCDD	OCDF	123478-HxCDD	123478-HxCDF	1234789-HpCDF	123678-HxCDD	123678-HxCDF	12378-PeCDD	12378-PeCDF	123789-HxCDD	123789-HxCDF	234678-HxCDF	23478-PeCDF	2378-TCDD	2378-TCDF
4631 sp01 - inf	grab	13,600 pg/l	1,180 pg/l	116,000 pg/l	6,600 pg/l	ND	95.4 pg/l	162 pg/l	798 pg/l	202 pg/l	ND	79.1 pg/l	196 pg/l	ND	ND	ND	ND	31.1 pg/l
4631 sp02 - inf	grab	479 pg/l	88 pg/l	7,920 pg/l	573 pg/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4659 sp01 - inf	grab	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4682 sp01 - inf	grab	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4682 sp02 - inf	grab	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4721 spD01 - inf	comp	446 pg/l	ND	4,160 pg/l	135 pg/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4721 sp01 - inf	comp	752 pg/l	86 pg/l	9,070 pg/l	357 pg/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4721 sp01 - inf	comp	593 pg/l	55 pg/l	6,290 pg/l	243 pg/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4721 sp01 - inf	comp	576 pg/l	ND	5,040 pg/l	136 pg/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4721 sp01 - inf	comp	496 pg/l	62 pg/l	4,630 pg/l	212 pg/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4721 sp02 - eff	-	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
4721 sp03 - inf	grab	551 pg/l	70 pg/l	5,080 pg/l	162 pg/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4721 sp05 - inf	grab	698 pg/l	ND	5,080 pg/l	290 pg/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4721 sp06 - inf	grab	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4759 sp01 - inf	comp	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4759 sp03 - eff	comp	ND	ND	100 pg/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

sp: sample point
inf: influent
eff: effluent

comp: composite sample
grab: grab sample

D: Duplicate
ND: Non-detect
NS: Not sampled

mg/l = 1000 ug/l
ug/l = 1000 ng/l
ng/l = 1000 pg/l

7.0 POLLUTANT PARAMETER SELECTION

7.1 Introduction

EPA reviewed wastewater characterization data presented in Chapter 6 to determine the conventional, nonconventional, and toxic pollutants that were detected at significant quantities in landfills wastewaters. These pollutants are classified by EPA into three categories: conventional, nonconventional and toxic pollutants. Conventional pollutants include BOD_5, TSS, oil and grease, and pH. Toxic pollutants (also called priority pollutants) include selected metals, pesticides and herbicides, and over 100 organic parameters that cover a comprehensive list of volatile and semi-volatile compounds. Nonconventional pollutants are any pollutants that do not fall within the specific conventional and toxic pollutant lists, for example, TOC, COD, chloride, fluoride, ammonia-nitrogen, nitrate/nitrite, total phenol, and total phosphorous.

EPA is authorized to regulate conventional and toxic pollutants under Sections 304(a)(4) and 301(b)(2)(C) of the Clean Water Act (CWA), respectively. The list of toxic pollutants from Section 307 of the CWA has been expanded from the 65 priority pollutants and classes of pollutants identified in the Settlement Agreement of NRDC vs Train (reference 54) to include 126 priority pollutants. In addition, the Agency also may regulate other nonconventional pollutants, taking into account factors such as treatable amounts, toxicity, analytical methods, frequency of occurrence, use of indicator pollutants and the pass through of pollutants at publicly owned treatment works (POTWs).

This chapter presents the criteria used for the selection of parameters determined to be pollutants of interest in the industry and the selection of pollutants for establishing effluent limitations guidelines and standards.

7.2 Pollutants Considered for Regulation

To characterize landfill wastewaters and to determine the pollutants that could potentially be discharged in significant amounts, EPA collected wastewater characterization samples at 15 landfill facilities that were analyzed for 470 conventional, toxic and nonconventional pollutants including metals, organics, pesticides, herbicides, and dioxins and furans. The wastewater characterization analysis is presented in Chapter 6.

From the original list of 470 analytes, EPA developed a list of pollutants of interest for each subcategory that reflects the types of pollutants typically found in landfill wastewaters. The pollutants of interest list provided a basis for calculating pollutant mass loadings for the industry and potential loading reduction benefits to be achieved from the proposed regulation. The list of pollutants of interest also served as the basis for selecting pollutants for regulation.

7.3 Selection of Pollutants of Interest

Pollutants of interest for landfill facilities were selected by subcategory using the wastewater characterization data presented in Chapter 6. Figure 7-1 presents a diagram that illustrates the procedures used to select pollutants of interest.

The following criteria were used to develop a pollutants of interest list for each subcategory:

1. Any pollutant detected three or more times in the influent at a concentration at or above 5 times the minimum level at more than one facility was determined to be a pollutant of interest.

2. For dioxins/furans, any pollutant detected three or more times in the influent at a concentration above the minimum level at more than one facility was determined to be a pollutant of interest.

3. Pollutants that are naturally occurring compounds found in soil or groundwater at landfill facilities or pollutants that are used as treatment chemicals in this industry were excluded from the pollutants of interest list.

The first criteria established a list of pollutants that were detected at significant concentrations at more than one facility and therefore, considered to be present at significant concentrations in all landfill wastewaters.

The second criteria was used to address dioxins and furans, which are potentially toxic even at low concentrations. At this stage, EPA selected any dioxin and furan as a pollutant of interest if it was detected in raw wastewater so that these pollutants could be further evaluated for regulation on a case-by-case basis.

Pollutants that met the first and second criteria but were naturally occurring compounds found in soil or groundwater or are found commonly in treatment chemicals were then excluded from the individual subcategory pollutants of interest list. These compounds include aluminum, boron, calcium, chloride, fluoride, iron, manganese, magnesium, potassium, silicon, sodium, sulfur, total phosphorus, and total sulfide.

Tables 7-1 and 7-2 present the final pollutants of interest selected for each subcategory. Non-Hazardous subcategory pollutants of interest presented in Table 7-1 are subdivided into those pollutants present at Subtitle D municipal solid waste landfills and those present at Subtitle D non-municipal solid waste landfills. However, these lists were combined into one pollutant of interest list for the entire Non-Hazardous landfill subcategory. Only one Non-Hazardous subcategory pollutant of interest, MCPA, was present at non-municipal solid waste landfills and was not present at municipal solid waste landfills. Therefore, MCPA was added to the list of pollutants of interest for the entire Non-Hazardous subcategory. Pollutants of interest in both subcategories include conventional, nonconventional, and toxic pollutants and include metals, organics, pesticides, herbicides, and dioxins and furans.

7.4 Development of Pollutant Discharge Loadings

EPA developed estimates of the mass loading of pollutant discharges for the pollutants of interest on a facility-by-facility basis. The loadings were determined for current discharges and for projected discharges based on each of the proposed regulatory options. Mass loadings were based on current discharge concentrations and potential regulated flows at each facility. Pollutant discharge loadings were calculated using the procedures described below.

7.4.1 Development of Current Discharge Concentrations

The current discharge concentration database contains the discharge concentration for each pollutant of interest at each facility in each subcategory. Mass loadings were determined by multiplying the pollutant concentration by the facility-specific regulated wastewater flow. EPA used all available data obtained during the project including Detailed Questionnaire data, detailed monitoring reports, and EPA sampling data to determine mass loadings.

In the Detailed Technical and Monitoring Questionnaires, facilities were requested to provide information on wastewater treatment-in-place and to provide concentration data on treated wastewater effluent. All available information for each facility on effluent wastewater was compiled using the data conventions discussed in Chapter 4 for raw wastewater. Data were available from the following sources: EPA sampling activities, the Detailed Technical Questionnaire, and the Detailed Monitoring Questionnaire. For facilities with multiple effluent sample points, the final effluent concentration was calculated by taking a flow weighted average of the samples. From this information, a data file was created that contained one average concentration value for each pollutant of interest at each facility. The amount of data in the file varied significantly from facility to facility. Several of the current discharge concentrations were based on of hundreds of sampling data points obtained through the Detailed Monitoring Questionnaire, while others may have been based on as few as one sampling data point. The Detailed Monitoring Questionnaire data reflects up to three years of data and is unique to each facility in terms of numbers of parameters analyzed and monitoring frequency. Additionally, monitoring may have been performed weekly, monthly, or quarterly. For facilities sampled by EPA, there was information available for all 470 analytes and sampling typically reflected the daily performance of a system over a five day period.

For facilities with wastewater treatment-in-place, but with either no available effluent data or incomplete effluent data, a treated effluent average concentration was generated. To develop the treated effluent average concentration, facilities were grouped by subcategory and then placed in treatment-in-place groups depending on the type of treatment employed on site. Within a treatment-in-place group, the treated effluent average concentration result for a pollutant of interest was calculated by taking the median of all weighted source averages for all facilities within the treatment-in-place group. If there were no data for a particular pollutant within a treatment-in-place group, the treated effluent average concentration result for a pollutant of interest in a subcategory was calculated by taking the median of all weighted source averages for all facilities within the entire subcategory.

For facilities with no treatment-in-place, raw wastewater concentrations were used to represent effluent discharge values. Facility averages were calculated using all available data sources and using the procedures outlined above. For facilities with no treatment-in-place and with either no influent data or incomplete influent data, the subcategory median raw wastewater results (see Section 6.3.3 for details on developing the raw wastewater Master File) were used to represent the current discharge for each pollutant of interest.

In the Hazardous subcategory and for Subtitle D non-municipal solid waste facilities in the Non-Hazardous subcategory, there were insufficient effluent data to calculate a representative treatment-in-place or subcategory treated effluent average concentration result for several pollutants of interest. In the Hazardous subcategory, the treated effluent average concentration was based on data from a limited number of facilities. Subtitle D non-municipal facilities did not provide adequate data to calculate current discharge concentration values for a majority of the pollutants of interest in the Non-Hazardous subcategory. The alternate methodologies developed to calculate representative current discharge concentration values for both the Hazardous subcategory and for Subtitle D non-municipal facilities in the Non-Hazardous subcategory are discussed below.

7.4.1.1 Alternate Methodology for Non-Hazardous Subcategory: Subtitle D Non-Municipal

For Subtitle D non-municipal solid waste facilities in the Non-Hazardous subcategory, the effluent data from municipal solid waste landfills was used to supplement insufficient non-municipal data. Due to the similarities in the median raw wastewater concentrations from Subtitle D municipal and non-municipal facilities, this procedure was determined to be appropriate. Subtitle D municipal and non-municipal raw wastewater concentration data are presented in the Non-Hazardous subcategory Master File in Table 6-7 in Chapter 6.

The procedure employed to calculate current discharge concentrations for Subtitle D non-municipal solid waste facilities is as follows: 1) use all available non-municipal landfill effluent data, 2) place non-municipal facilities in municipal facility treatment-in-place groups according to treatment-in-place employed on-site, and 3) use municipal landfills treatment-in-place treated effluent average concentration results for each non-municipal facility with insufficient data.

One Non-Hazardous subcategory pollutant of interest, MCPA, was determined to be a pollutant of interest for non-municipal landfills, but not for municipal landfills and, therefore, treated effluent average concentration data were not available. In this case, the Master File raw wastewater concentration for MCPA from non-municipal facilities was considered along with the typical percent removals for the treatment-in-place groups. Treatment-in-place group removals for MCPA were estimated using the regulatory treatment option removals. For treatment-in-place groups with either no regulatory treatment option match or with insufficient data, the National Risk Management Research Laboratory (NRMRL) treatment database (discussed in Section 4.8.4) was used as a supplement. If no NRMRL treatment data existed, treatment data for other pollutants within the same analytical method or similar methods were used. Removals from both the regulatory treatment options and the NRMRL treatment database then were averaged together to obtain the estimated removal for each treatment-in-place group. The current discharge concentration then was calculated by multiplying the Master File raw wastewater result by the estimated treatment-in-place group percent removal (calculated as described above) and subtracting that value from the Master File result.

7.4.1.2 Alternate Methodology for the Hazardous Subcategory

Current discharge concentrations for the facilities in the Hazardous subcategory were estimated using the long term averages developed for the subcategory (see Chapter 11: Development of Effluent Limitations and Standards). A current discharge concentration file similar to the one developed for municipal solid waste facilities in the Non-Hazardous subcategory could not be developed for hazardous facilities because of a lack of data. The lack of data was due to the fact that there were no direct discharging hazardous facilities identified in the EPA database. Therefore, the current discharge concentrations were modeled on the indirect dischargers in the EPA database as a function of the expected discharge concentrations after treatment using the long term averages. Industry-provided effluent data were used whenever available. An approach was developed to estimate the expected discharge concentration from the installed treatment systems at each facility where data was not available. These current discharge concentration values were developed as a multiple of the required effluent concentrations.

Based upon the installed treatment system at the facility, a procedure was created to model the characteristics of the current discharge concentrations. The current discharge concentration was estimated as twice the long term average (LTA) for a facility without any biological or chemical treatment in place. The modeling approach used to develop the current discharge concentration for the indirect dischargers in the Hazardous subcategory is presented below.

QID	Treatment-In-Place	Modeling Scheme
16017	Separation and neutralization	2 x LTA^{med}
16041	Sequencing batch reactors	LTA
16087	Equalization, chemical precipitation, primary sedimentation, activated sludge, and secondary sedimentation	LTA

For facility 16017, the current discharge concentration value was based upon a function of the LTA^{med}. The LTA^{med} is defined as the median of the long term averages in the Hazardous subcategory. The long term averages used in this subcategory are from BAT facilities 16041 and 16087; therefore, the corresponding long term averages were used for both of these BAT facilities.

7.4.2 Development of Pollutant Mass Loadings

Using the current discharge concentration file discussed above, EPA generated mass loading estimates for each pollutant of interest by multiplying the current discharge concentration value by the facility's average discharge daily flow rate. This resulted in mass loadings, reported in pounds per day, for each facility in the database. Mass loadings were calculated to determine the amount of pollution discharged directly or indirectly to surface waters by landfill facilities and to determine the amount of pollutants projected to be discharged after implementation of the proposed regulatory technology. Summaries of pollutant mass loadings for the selected regulatory options are presented in Chapter 11.

7.5 Assessment of Pollutants of Interest

As indicated above, EPA developed extensive lists of pollutants of interest for this industry. The full list of pollutants of interest were used to develop pollutant loadings and pollutant reductions as a result of treatment. However, only certain pollutants were selected for regulation. The specific regulation of every pollutant may not be the most cost-effective approach to developing effluent limitations guidelines.

The treatment technologies evaluated as the basis of the proposed regulation have been demonstrated to provide removals for classes of compounds with similar treatability characteristics. Several of the pollutants of interest in the landfill industry are similar in terms of their chemical structure and treatability. As a result, the regulation of a set of pollutants within a chemical class ensures that the treatment technologies will provide adequate control of other pollutants of interest within that class of compounds.

Based upon this analysis, several pollutants of interest were not selected for regulation in the Non-Hazardous and Hazardous subcategories because they are represented adequately by another regulated pollutant or are controlled through regulation of another related parameter, as discussed in the sections below. In addition, several other pollutants of interest also were not selected for regulation because inadequate data were available for these pollutants at the facilities selected as the technology basis of the regulation. The methodology used in the selection of the BPT/BAT/NSPS and PSES/PSNS facilities from which the limits are based is described in Chapter 11. At these selected BPT facilities, several of the pollutants of interest were found at concentrations below treatable levels, while others were found at only trace amounts and therefore were not considered likely to cause toxic effects.

7.6 Selection of Pollutants To Be Regulated for Direct Dischargers

Based upon the data analyses outlined above, EPA developed a list of pollutants to be regulated for the Hazardous and Non-Hazardous subcategories. Figure 7-2 presents a diagram that illustrates the procedures used to select pollutants to be regulated. EPA is not proposing to establish effluent limitations and standards for all conventional, toxic, and nonconventional pollutants. There may be constituents present in a specific landfill or type of landfill that are not addressed in the development of this guideline and which may be of concern to a receiving stream or POTW. Due to the specific nature of landfill waste at various sites, EPA concludes that Best Professional Judgement (BPJ) should be used for considering specific wastewater characteristics that may be unique to a particular landfill and were not identified during the proposed rulemaking process. The following sections discuss EPA's reasons for not proposing effluent limitations for selected pollutants.

7.6.1 Non-Hazardous Subcategory Pollutants to be Regulated for Direct Dischargers

The proposed list of pollutants to be regulated for the Non-Hazardous subcategory was developed from the pollutants of interest list for the Non-Hazardous subcategory. The Non-Hazardous pollutants of interest list combines the pollutants of interest from Subtitle D municipal and non-municipal solid waste facilities for a total of 33 pollutants of interest. The pollutants chosen to be regulated were demonstrated to be removed by equalization, biological treatment, and multimedia filtration. Initially, all 33 pollutants of interest were considered for regulation; however, after a thorough analysis was conducted, 24 pollutants of interest were not selected for regulation under BPT/BAT/NSPS for one of the following reasons:

- The pollutant (or pollutant parameter) is controlled through the regulation of other pollutants (or pollutant parameters).
- The pollutant (or pollutant parameter) is present in only trace amounts and/or is not likely to cause toxic effects.

- The pollutant (or pollutant parameter) is not present in treatable amounts at the selected BPT facilities upon which the effluent limitations are based.

The following nine Non-Hazardous subcategory pollutants of interest are pollutants that are controlled through the regulation of other pollutants**:**

Nine Pollutants Not Selected for Regulation in the Non-Hazardous Subcategory Because They Are Controlled Through the Regulation of Other Pollutants
COD TOC Total Phenols Hexanoic Acid O-Cresol 2-Butanone 2-Propanone 4-Methyl-2-Pentanone Tripropyleneglycol Methyl Ether

COD is an alternative method of estimating the oxygen demand of the wastewater; however, BOD_5 has been selected for regulation because it is more appropriately controlled by a biological treatment system. TOC measures all oxidizable organic material in a waste stream, including the organic chemicals not oxidized (and therefore not detected) in BOD_5 and COD tests. TOC is a rapid test for estimating the total organic carbon in a waste stream. For similar reasons to those for not selecting COD for regulation, TOC also was not selected for regulation because BOD_5 is a more appropriate control parameter for biological treatment systems. Total phenols is a general, wet chemistry indicator measurement for phenolic compounds and should be controlled by regulating phenol. Similarly, hexanoic acid is relatively biodegradable and should be controlled by regulating benzoic acid. O-cresol is structurally similar to p-cresol and should be controlled by regulating p-cresol. Since 2-butanone, 2-propanone and 4-methyl-2-pentanone have similar treatability characteristics as toluene in a biological treatment system, these three pollutants should be controlled by regulating toluene. Tripropyleneglycol methyl ether has similar treatability characteristics as alpha-terpineol in a biological treatment system and should be controlled by regulating alpha-terpineol.

The following ten Non-Hazardous subcategory pollutants of interest are present in only trace amounts and/or are not likely to cause toxic effects:

Ten Pollutants Not Selected for Regulation in the Non-Hazardous Subcategory Because They Are Present In Only Trace Amounts And/Or Are Not Likely To Cause Toxic Effects
Nitrate/Nitrite
TDS
N,N-Dimethylformamide
1,4-Dioxane
Methylene Chloride
Dichloroprop
Disulfoton
MCPA
1,2,3,4,6,7,8-HpCDD
OCDD

For this industry, nitrate/nitrite is used primarily as a measure of the extent of nitrification that occurs during the biodegradation process. Typically, levels of nitrate/nitrite found in landfill wastewaters do not require removal. Removal of nitrate/nitrite can be obtained by specially designed biological treatment systems (such as nitrification/denitrification systems) that are able to complete the conversion of nitrate/nitrite to nitrogen gas. Often, removal of nitrate/nitrite is required to address specific water quality concerns for an individual receiving water (i.e., nutrient problems in the Great Lakes); however, EPA has determined that the levels of nitrate/nitrite in landfill wastewaters does not justify regulation on a national level and specific water quality considerations can be addressed by individual permit writers.

TDS is used primarily as a water quality measurement and not as a pollutant that can be controlled through biological treatment. It often is used as a measurement of the salinity of an ambient water or a wastewater and often indicates the presence of such naturally occurring salts as sodium, iron, and magnesium. While it can inhibit biological treatment processes at levels above 10,000 mg/l, acclimated biological treatment systems can operate successfully with influent TDS concentrations as high as 76,000 mg/l (reference 55). The median concentration of total dissolved solids in the Non-

Hazardous subcategory was only 4,900 mg/l for non-municipal solid waste landfills and 2,900 mg/l for municipal solid waste landfills. Therefore, EPA has determined that concentrations of total dissolved solids found in landfills in the Non-Hazardous subcategory do not justify regulation. Levels of n,n-dimethylformamide found in landfill wastewaters generally were observed near the analytical detection limit (median concentration for non-hazardous municipal solid waste landfills was 10 ug/l) and did not warrant regulation.

Two other pollutants, 1,4-dioxane and methylene chloride, are volatile pollutants that are not biodegraded during biological treatment, but rather are stripped out of the wastewater into the atmosphere during the aeration process. While EPA does not recognize the transfer of pollutants from one medium to another as effective treatment, based on the concentrations of these pollutants in untreated wastewaters, the Agency believes that the loadings of these pollutants to the atmosphere will be well below the threshold levels to be established by EPA's Air Programs for air discharges from wastewater treatment systems and, therefore, is excluding these two pollutants from regulation because they are not likely to cause toxic effects.

EPA found low levels of dichloroprop; disulfoton; MCPA; 1,2,3,4,6,7,8-HpCDD, and OCDD in raw wastewaters at several Non-Hazardous subcategory landfills. At the concentrations found, these pollutants are expected to partition to the biological sludge as part of the proposed BPT/BAT treatment technologies. EPA sampling data and calculations conclude that the concentrations of these pollutants present in the wastewater would not prevent the sludge from being redeposited in a non-hazardous landfill.

The following five pollutants were not selected for regulation in the Non-Hazardous subcategory because they are not present at treatable concentrations at those facilities chosen as the basis for the development of effluent limitations:

Five Pollutants Not Selected For Regulation in the Non-Hazardous Subcategory Because They Are Not Present at Treatable Concentrations at Those Facilities Chosen as the Basis for Developing Effluent Limitations
Barium Chromium Hexavalent Chromium Strontium Titanium

These five metals were present in wastewaters at the facilities selected as the basis for BPT/BAT/NSPS, but EPA has determined that these pollutants are not removed readily by the selected BPT/BAT/NSPS treatment technology (biological treatment) at the observed concentrations and should not be regulated. Mean raw wastewater concentrations of these five metals at BPT facilities ranged from 0.07 mg/l for chromium and titanium to 2.8 mg/l for strontium. Percent removals at these BPT facilities ranged from negative removals for hexavalent chromium and barium, to low percent removals for strontium (12 percent), to relatively high percent removals for chromium (46 percent and 57 percent) and titanium (92 percent). While the negative and low percent removals were observed at BPT facilities with relatively high influent concentrations, the higher percent removals were observed at BPT facilities with influent concentrations of chromium and titanium approaching the method detection limit, which raises doubt about the accuracy of these percent removals. EPA also considered control of these five pollutants by other technologies, but the observed concentrations were considered well below treatable concentrations for conventional metals treatment technologies (for example, chemical precipitation).

In conclusion, the following nine pollutants of interest are proposed for regulation in the Non-Hazardous subcategory:

Nine Pollutants Selected for Regulation in the Non-Hazardous Subcategory
BOD_5
TSS
Ammonia as Nitrogen
Zinc
Alpha-Terpineol
Benzoic Acid
P-Cresol
Phenol
Toluene

The Agency wishes to note that zinc was selected for regulation in spite of the fact that exclusion criteria used to eliminate other pollutants of interest apply, at least partially. Zinc has been selected for regulation in spite of its relatively low untreated wastewater concentration. The median concentration of zinc found in raw wastewater at municipal solid waste landfills and at non-municipal solid waste landfills is 0.14 mg/l and 0.09 mg/l, respectively. Zinc was selected for regulation because EPA observed incidental removals ranging from 66 percent to 93 percent at the treatment systems selected for BPT. Additionally, raw wastewater concentrations of zinc were not observed at levels that would inhibit biological treatment systems (see Chapter 11, Section 11.2.1).

The development of the effluent limitations for each of these pollutants is described in detail in Chapter 11.

7.6.2 Hazardous Subcategory Pollutants to be Regulated for Direct Dischargers

The preliminary list of pollutants to be regulated for the Hazardous subcategory was developed from the Hazardous subcategory pollutants of interest list. The pollutants chosen to be regulated were demonstrated to be removed by chemical precipitation followed by biological treatment. Initially, all 63 pollutants of interest were considered for regulation; however, after a thorough analysis was conducted, 48 pollutants of interest were not selected for regulation under BPT/BAT/NSPS for one of the following reasons:

- The pollutant (or pollutant parameter) is controlled through the regulation of other pollutants (or pollutant parameters).

- The pollutant (or pollutant parameter) is present in only trace amounts and/or is not likely to cause toxic effects.

- The pollutant (or pollutant parameter) is not present in treatable amounts at the selected BPT facilities upon which the effluent limitations are based.

The following seventeen Hazardous subcategory pollutants of interest were not selected for regulation because they are controlled through the regulation of other pollutants:

Seventeen Pollutants Not Selected For Regulation in the Hazardous Subcategory Because They Are Controlled Through the Regulation of Other Pollutants
COD TOC Total Phenols 2-Butanone 2-Propanone 2,4-Dimethylphenol 4-Methyl-2-Pentanone Benzyl Alcohol Diethyl Ether Ethylbenzene Isobutyl Alcohol Hexanoic Acid Nickel M-Xylene O-Cresol O+P Xylene Tripropyleneglycol Methyl Ether

COD is an alternative method of estimating the oxygen demand of the wastewater; however, BOD_5 has been selected for regulation because it is more appropriately controlled by a biological treatment system. TOC measures all oxidizable organic material in a waste stream, including the organic chemicals not oxidized (and therefore not detected) in BOD_5 and COD tests. TOC is a rapid test for estimating the total organic carbon in a waste stream. For similar reasons to the rationale for not selecting COD for regulation, TOC was also not selected for regulation because BOD_5 is a more appropriate control parameter for biological treatment systems.

While present in treatable concentrations, EPA did not collect adequate performance data for nickel at well-operated landfill facilities with the recommended technology basis for the Hazardous subcategory; however, nickel should be controlled adequately through the regulation of both chromium and zinc. Total phenols is a general, wet chemistry indicator measurement for phenolic compounds and should be controlled by regulating phenol. Similarly, 2,4-dimethylphenol has similar chemical and treatability characteristics to phenol and therefore should also be controlled through the regulation of phenol. Hexanoic acid, benzyl alcohol, and isobutyl alcohol are relatively biodegradable and should be controlled by regulating benzoic acid. O-cresol is structurally similar to p-cresol and should be controlled by regulating p-cresol. M-xylene, o+p-xylene, 2-butanone, 2-propanone, 4-methyl-2-pentanone, and ethylbenzene have similar treatability characteristics as toluene in a biological treatment system and should be controlled by regulating toluene. Similarly, tripropyleneglycol methyl ether and diethyl ether have similar treatability characteristics as alpha-terpineol in a biological treatment system and should be controlled by regulating alpha-terpineol.

The following twenty-two pollutants of interest were not selected for regulation in the Hazardous subcategory because they are present in only trace amounts and/or are not likely to cause toxic effects:

Twenty-Two Pollutants Not Selected for Regulation in the Hazardous Subcategory Because They Are Present In Only Trace Amounts And/Or Are Not Likely To Cause Toxic Effects
Hexane Extractable Material
Nitrate/Nitrite
TDS
1,1-Dichloroethane
1,4-Dioxane
Methylene Chloride
Trans-1,2-Dichloroethene
Trichloroethene
Vinyl Chloride
2,4-D
2,4-DB
2,4,5-TP
Dicamba
Dichloroprop
MCPA
MCPP
Picloram
Terbutylazine
1,2,3,4,6,7,8-HpCDD
1,2,3,4,6,7,8-HpCDF
OCDD
OCDF

For this industry, nitrate/nitrite is used primarily as a measure of the extent of nitrification that occurs during the biodegradation process. Typically, levels of nitrate/nitrite found in landfill wastewaters do not require removal. Removal of nitrate/nitrite can be obtained by specially designed biological treatment systems (such as nitrification/denitrification systems) that are able to complete the conversion of nitrate/nitrite to nitrogen gas. Often, removal of nitrate/nitrite is required to address specific water quality concerns for an individual receiving water (i.e., nutrient problems in the Great Lakes); however, EPA has determined that the levels of nitrate/nitrite in landfill wastewaters does not justify regulation on a national level and specific water quality considerations can be addressed by individual permit writers.

TDS is used primarily as a water quality measurement and not as a pollutant that can be controlled through biological treatment. It often is used as a measurement of the salinity of an ambient water or a wastewater and often indicates the presence of such naturally occurring salts as sodium, iron, and magnesium. While it can inhibit biological treatment processes at levels above 10,000 mg/l, acclimated biological treatment systems can operate successfully with influent TDS concentrations as high as 76,000 mg/l (reference 55). The median concentration of total dissolved solids was 12,600 mg/l for landfills in the Hazardous subcategory. Therefore, EPA has determined that concentrations of total dissolved solids found in landfills in the Hazardous subcategory do not justify regulation. Similarly, hexane extractable material is a general, wet chemistry indicator measurement for oil and grease compounds that generally can be controlled through source reduction and good housekeeping. Therefore EPA did not select hexane extractable material for regulation.

Six other pollutants , 1,1-dichloroethane, 1,4-dioxane, methylene chloride, trans-1,2-dichloroethene, trichloroethene and vinyl chloride, are volatile pollutants that are not biodegraded during biological treatment, but rather are stripped out of the wastewater into the atmosphere during the aeration process. While EPA does not recognize the transfer of pollutants from one medium to another as effective treatment, based on the concentrations of these pollutants in untreated wastewaters, the Agency believes that the loadings of these pollutants to the atmosphere will be well below the threshold levels to be established by EPA's Air Programs for air discharges from wastewater treatment systems and, therefore, is excluding these six pollutants from regulation because they are not likely to cause toxic effects.

Low levels of 2,4-D, 2,4-DB, 2,4,5-TP, dicamba, dichloroprop, MCPA, MCPP, picloram, terbutylazine, 1,2,3,4,6,7,8-HpCDD, 1,2,3,4,6,7,8-HpCDF, OCDD, and OCDF were detected in over half of the Hazardous subcategory landfills sampled during EPA's sampling program. At the concentrations found in raw landfill wastewaters, these pollutants are expected to partition to the biological sludge as part of the proposed BPT/BAT/PSES treatment technologies. EPA sampling data and calculations conclude that the concentrations of these pollutants present in the untreated wastewater would not prevent the sludge from being redeposited in a hazardous landfill.

The following nine pollutants were not selected for regulation in the Hazardous subcategory because they are not present at treatable concentrations at those facilities chosen as the basis for developing effluent limitations:

Nine Pollutants Not Selected for Regulation in the Hazardous Subcategory Because They Are Not Present at Treatable Concentrations at Those Facilities Chosen as the Basis for Developing Effluent Limitations
Amenable Cyanide
Copper
Lithium
Molybdenum
Selenium
Strontium
Tin
Titanium
Total Cyanide

While several of these pollutants were found in treatable concentrations at selected BPT facilities, the Hazardous subcategory median untreated wastewater concentrations for many of these pollutants were well below treatable concentrations. Median untreated wastewater concentrations of six of the metals ranged from about 0.02 to 0.06 mg/l for selenium, copper, titanium, and tin; 0.16 mg/l for molybdenum; and 0.8 mg/l for lithium, which are well below treatable concentrations for conventional metals precipitation technologies. While median untreated wastewater concentrations for strontium are estimated at 1.5 mg/l for the Hazardous subcategory, performance data from a BPT facility shows only a 12 percent removal of strontium at an influent concentration of 2.8 mg/l.

For total cyanide, the median untreated wastewater concentration for the Hazardous subcategory has been estimated at 0.05 mg/l, which is well below treatable concentrations for conventional cyanide destruction technologies. While median untreated wastewater concentrations of amenable cyanide have been estimated at 1.6 mg/l, EPA believes that the median untreated wastewater concentration data for total cyanide is more representative of cyanide concentrations in hazardous landfill wastewaters than amenable cyanide data, since the Agency has collected much more data on total cyanide than on amenable cyanide.

Based on these factors, the Agency has concluded that these seven metals plus amenable and total cyanide were present in untreated landfill wastewaters at concentrations that were too low to be treated effectively by conventional metals and cyanide treatment technologies (chemical precipitation and chemical oxidation, respectively) and has decided to exclude them from regulation.

In conclusion, the following 15 pollutants of interest are proposed for regulation under BPT/BAT/NSPS in the Hazardous subcategory:

Fifteen Pollutants Selected For Regulation In The Hazardous Subcategory
BOD_5
TSS
Ammonia as Nitrogen
Arsenic
Chromium
Zinc
Alpha-Terpineol
Aniline
Benzene
Benzoic Acid
Naphthalene
P-Cresol
Phenol
Pyridine
Toluene

The development of the effluent limitations for each of these pollutants is described in detail in Chapter 11.

7.7 Selection of Pollutants to be Regulated for Indirect Dischargers

Section 307(b) of the CWA requires the Agency to promulgate pretreatment standards for existing sources (PSES) and new sources (PSNS). To establish pretreatment standards, EPA must first determine whether each BAT pollutant under consideration passes through a POTW, or interferes with the POTW's operation or sludge disposal practices.

7.7.1 Pass-Through Analysis for Indirect Dischargers

The Agency evaluated POTW pass-through for the landfill pollutants of interest for both subcategories, listed in Tables 7-1 and 7-2. In determining whether a pollutant is expected to pass through a POTW, the Agency compared the nation-wide average percentage of a pollutant removed by well-operated POTWs with secondary treatment to the percentage of a pollutant removed by BAT treatment systems. A pollutant is determined to “pass through” a POTW when the average percentage removal achieved by a well-operated POTW (i.e. those meeting secondary treatment standards) is less than the percentage removed by the industry's direct dischargers that are using the proposed BAT technology.

This approach to the definition of pass-through satisfies two competing objectives set by Congress: 1) that wastewater treatment performance for indirect dischargers be equivalent to that for direct dischargers, and 2) that the treatment capability and performance of the POTW be recognized and taken into account in regulating the discharge of pollutants from indirect dischargers. Rather than compare the mass or concentration of pollutants discharged by the POTW with the mass or concentration of pollutants discharged by a BAT facility, EPA compares the percentage of the pollutants removed by the BAT treatment system with the POTW removal. EPA takes this approach because a comparison of mass or concentration of pollutants in a POTW effluent to pollutants in a BAT facility's effluent would not take into account the mass of pollutants discharged to the POTW from non-industrial sources, nor the dilution of the pollutants in the POTW effluent to lower concentrations from the addition of large amounts of non-industrial wastewater.

To establish the performance of well-operated POTWs, EPA used the information provided from "Fate of Priority Pollutants in Publicly Owned Treatment Works", referred to as the 50-POTW Study, supplemented by EPA's National Risk Management Research Laboratory's (NRMRL) treatability database. NRMRL's database was used for those pollutants not found in the 50-POTW study. These studies were discussed previously in Chapter 4. Because the data collected for evaluating POTW removals included influent levels of pollutants that were close to the detection limit, the POTW data were edited to eliminate low influent concentration levels. For analytes that included a combination of high and low influent concentrations, the data were edited to eliminate all influent values, and corresponding effluent values, less than 10 times the minimum level. For analytes where no influent concentrations were greater than 10 times the minimum level, all influent values less than five times the minimum level and the corresponding effluent values were eliminated. For analytes where no influent concentration was greater than five times the minimum level, the data were edited to eliminate all influent concentrations, and corresponding effluent values, less than 20 µg/l. These editing rules were used to eliminate low POTW removals that simply reflected low influent levels. The POTW database was further edited so that only treatment technology data for activated sludge, aerobic lagoons, and activated sludge with filtration were used.

After editing the database according to the above criteria, EPA averaged the remaining influent data and the remaining effluent data from the 50-POTW database. The percent removals achieved for each pollutant were determined from these averaged influent and effluent levels. This percent removal was then compared to the percent removal for the proposed BAT option treatment technology.

7.7.2 Non-Hazardous Subcategory Pollutants to be Regulated for Indirect Dischargers

EPA conducted a pass-through analysis on the priority and nonconventional pollutants proposed to be regulated under BAT for hazardous landfills. The pass-through analysis was not performed for the regulated conventional pollutants, namely BOD_5 and TSS, since the conventional pollutants are not regulated under PSES and PSNS. Of the seven nonconventional and toxic pollutants regulated under BAT for the Non-Hazardous subcategory, only one pollutant proposed for regulation under

BAT, ammonia as nitrogen, appeared to pass through. However, for the reasons discussed in Chapter 11, EPA is not proposing pretreatment limits for ammonia, or any other pollutant, in the Non-Hazardous subcategory.

7.7.3 Hazardous Subcategory Pollutants to be Regulated for Indirect Dischargers

EPA conducted a pass-through analysis on the priority and nonconventional pollutants proposed to be regulated under BAT for hazardous landfills. The pass-through analysis was not performed for the regulated conventional pollutants, namely BOD_5 and TSS, since the conventional pollutants are not regulated under PSES and PSNS. Of the thirteen nonconventional and toxic pollutants regulated under BAT for the Hazardous subcategory, seven were determined to pass through. However, EPA proposes pretreatment standards for only the following six pollutants: ammonia as nitrogen, benzoic acid, toluene, alpha-terpineol, p-cresol, and aniline. Even though phenol appeared to pass through, EPA has decided not to set pretreatment standards for phenol. The rationale for not setting pretreatment standards for phenol can be found in Chapter 11. The list of pollutants regulated under BAT, the BAT option percent removals, the average POTW percent removals, and the results of the pass-through analysis for the Hazardous subcategory are shown in Table 7-3. The proposed pretreatment standards for the Hazardous subcategory are listed in Table 11-12.

Six Pollutants Selected For Regulation For Indirect Dischargers In The Hazardous Subcategory
Ammonia as Nitrogen
Alpha-Terpineol
Aniline
Benzoic Acid
P-Cresol
Toluene

The development of the pretreatment limitations for each of these pollutants is described in detail in Chapter 11.

Table 7-1: Non-Hazardous Subcategory Pollutants of Interest

Non-Hazardous Pollutant of Interest	Cas #	Subtitle D Municipal Pollutant of Interest	Subtitle D Non-Municipal Pollutant of Interest
Conventional			
BOD	C-002	X	X
TSS	C-009	X	X
Nonconventional			
Ammonia as Nitrogen	7664417	X	X
COD	C-004	X	X
Nitrate/Nitrite	C-005	X	X
TDS	C-010	X	X
TOC	C-012	X	X
Total Phenols	C-020	X	X
Organic			
1,4-Dioxane	123911	X	
2-Butanone	78933	X	
2-Propanone	67641	X	
4-Methyl-2-Pentanone	108101	X	
Alpha-Terpineol	98555	X	
Benzoic Acid	65850	X	
Hexanoic Acid	142621	X	
Methylene Chloride	75092	X	
N,N-Dimethylformamide	68122	X	
O-Cresol	95487	X	
P-Cresol	106445	X	
Phenol	108952	X	
Toluene	108883	X	
Tripropyleneglycol Methyl Ether	20324338	X	
Metals			
Barium	7440393	X	
Chromium	7440473	X	
Hexavalent Chromium	18540299	X	
Strontium	7440246	X	X
Titanium	7440326	X	
Zinc	7440666	X	
Pesticides/Herbicides			
Dichloroprop	120365	X	
Disulfoton	298044	X	
MCPA	94746		X
Dioxins/Furans			
1234678-HpCDD	35822469	X	
OCDD	3268879	X	

Table 7-2: Hazardous Subcategory Pollutants of Interest

Pollutant of Interest	Cas #	Pollutant of Interest	Cas #
Conventional		**Organics (cont.)**	
BOD	C-002	P-Cresol	106445
Hexane Extractable Material	C-036	Toluene	108883
TSS	C-009	Trans-1,2-Dichloroethene	156605
Nonconventional		Trichloroethene	79016
Amenable Cyanide	C-025	Tripropyleneglycol Methyl Ether	20324338
Ammonia as Nitrogen	7664417	Vinyl Chloride	75014
COD	C-004	**Metals**	
Nitrate/Nitrite	C-005	Arsenic	7440382
TDS	C-010	Chromium	7440473
TOC	C-012	Copper	7440508
Total Phenols	C-020	Lithium	7439932
Organics		Molybdenum	7439987
1,1-Dichloroethane	75343	Nickel	7440020
1,4-Dioxane	123911	Selenium	7782492
2,4-Dimethylphenol	105679	Strontium	7440246
2-Butanone	78933	Tin	7440315
2-Propanone	67641	Titanium	7440326
4-Methyl-2-Pentanone	108101	Total Cyanide	57125
Alpha-Terpineol	98555	Zinc	7440666
Aniline	62533	**Pesticides/Herbicides**	
Benzene	71432	2,4,5-TP	93721
Benzoic Acid	65850	2,4-D	94757
Benzyl Alcohol	100516	2,4-DB	94826
Diethyl Ether	60297	Dicamba	1918009
Ethylbenzene	100414	Dichloroprop	120365
Hexanoic Acid	142621	MCPA	94746
Isobutyl Alcohol	78831	MCPP	7085190
Methylene Chloride	75092	Picloram	1918021
M-Xylene	108383	Terbuthylazine	5915413
Napthalene	91203	**Dioxins/Furans**	
O+P Xylene	136777612	1234678-HpCDD	35822469
O-Cresol	95487	1234678-HpCDF	67562394
Phenol	108952	OCDD	3268879
Pyridine	110861	OCDF	39001020

Table 7-3: Pass-Through Analysis for Pollutants to be Regulated in the Hazardous Subcategory

Pollutant	Average BAT Percent Removal	Average POTW Percent Removal	Pass-Through
Ammonia	74%	60%	Yes
Arsenic	55%	66%	No
Chromium	80%	82%	No
Zinc	64%	81%	No
Alpha Terpineol	99%	95%	Yes
Aniline	98%	62%	Yes
Benzene	88%	95%	No
Benzoic Acid	99%	82%	Yes
Naphthalene	80%	95%	No
P-Cresol	98%	68%	Yes
Phenol	99%	95%	Yes
Pyridine	57%	95%	No
Toluene	99%	96%	Yes

Figure 7-1: Development of Pollutants of Interest

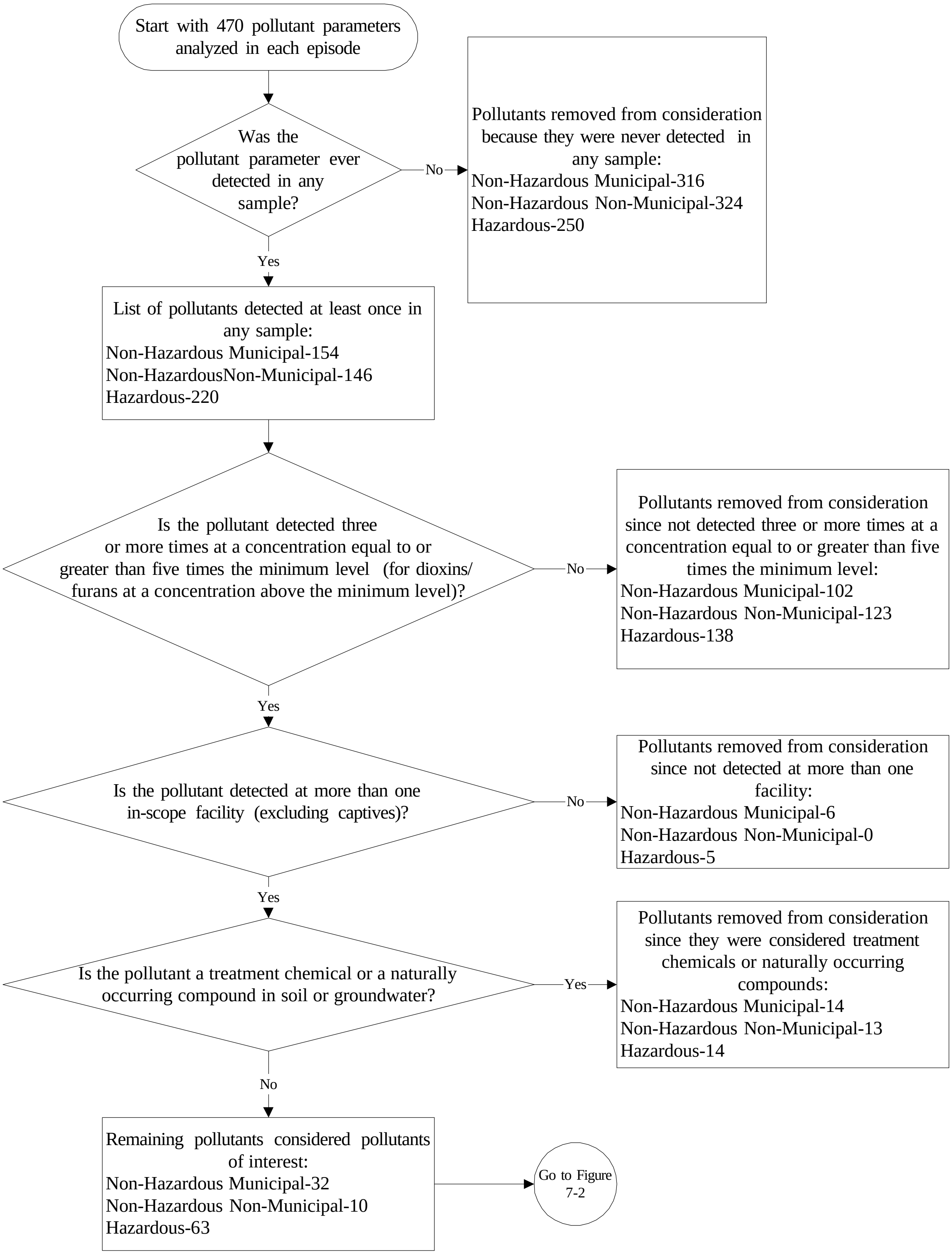

Figure 7-2: Selection of Pollutants to be Regulated